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Steil

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(54) **FIREARM WITH INTERCHANGEABLE PARTS**

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(22) Filed: **Dec. 1, 2015**

Related U.S. Application Data

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(51) **Int. Cl.**

F41A 3/64	(2006.01)
F41A 3/66	(2006.01)
F41A 5/18	(2006.01)
F41A 21/00	(2006.01)
F41A 3/72	(2006.01)
F41A 15/16	(2006.01)
F41C 23/16	(2006.01)
F41G 1/02	(2006.01)
F41A 9/64	(2006.01)

(52) **U.S. Cl.**
CPC .. ***F41A 5/18*** (2013.01); ***F41A 3/66*** (2013.01); ***F41A 3/72*** (2013.01); ***F41A 9/64*** (2013.01); ***F41A 15/16*** (2013.01); ***F41A 21/00*** (2013.01); ***F41C 23/16*** (2013.01); ***F41G 1/02*** (2013.01)

(58) **Field of Classification Search**
CPC F41A 3/64; F41A 3/66; F41A 3/14; F41A 5/26; F41A 5/28; F41A 5/30; F41A 11/00; F41A 11/02; F41A 21/48; F41A 21/481; F41A 21/482
See application file for complete search history.

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Assistant Examiner — Derrick Morgan
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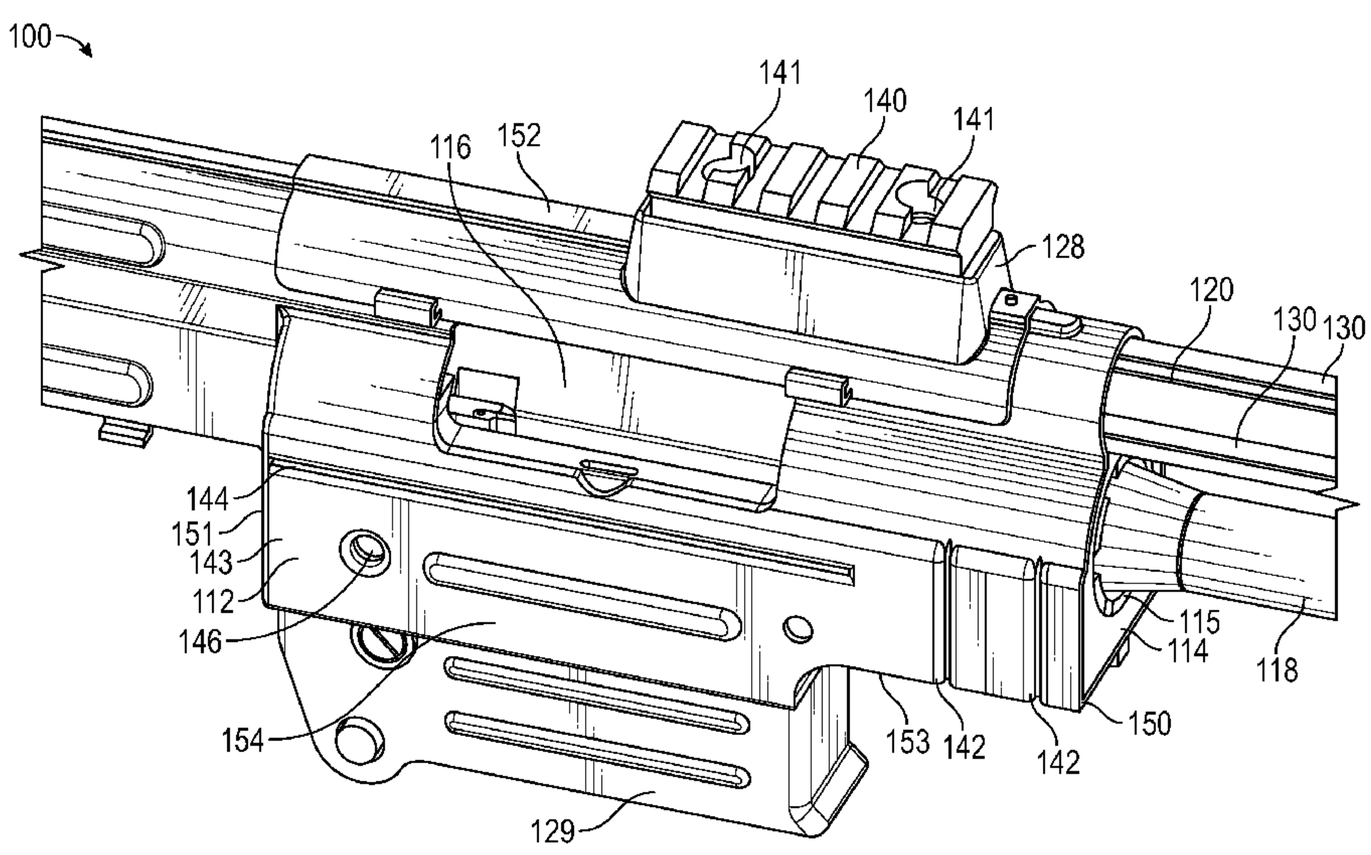
(57) **ABSTRACT**

A modernized firearm including interchangeable features.

20 Claims, 23 Drawing Sheets



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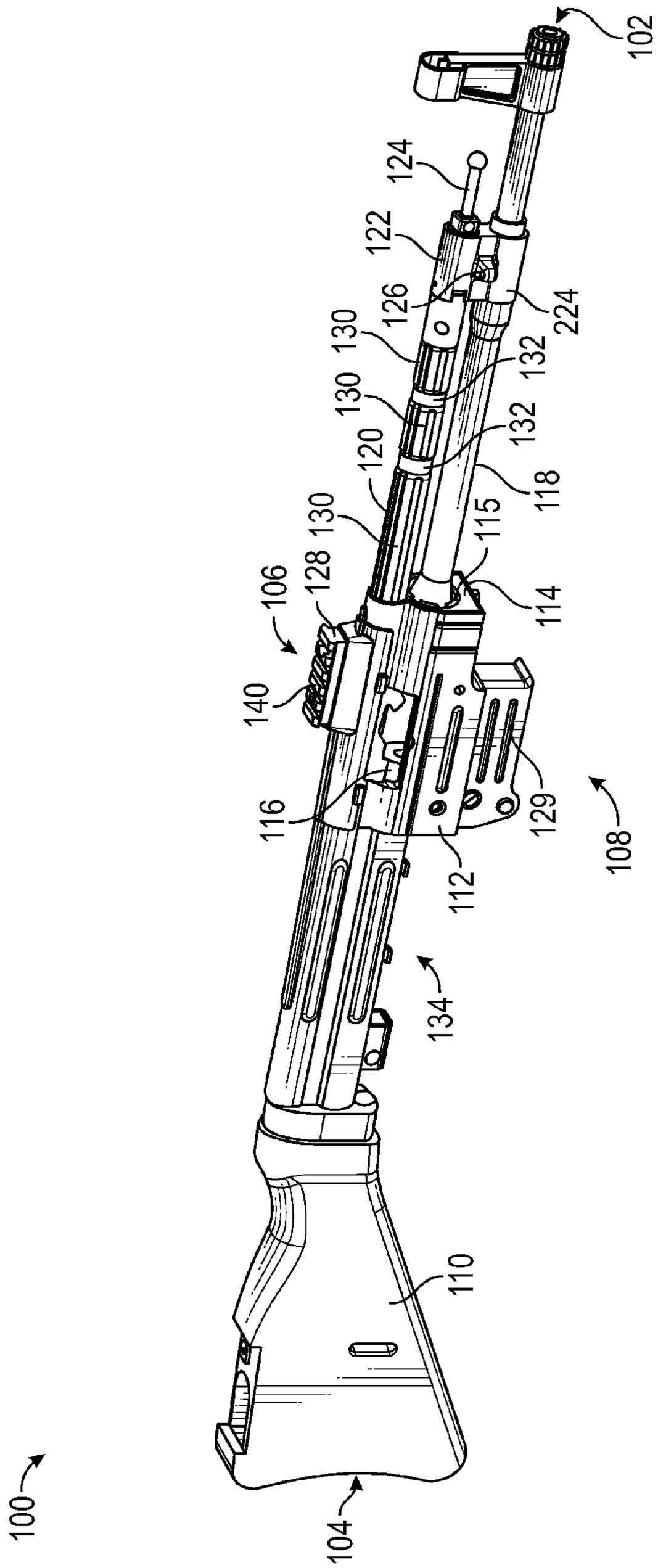
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FIG. 1A

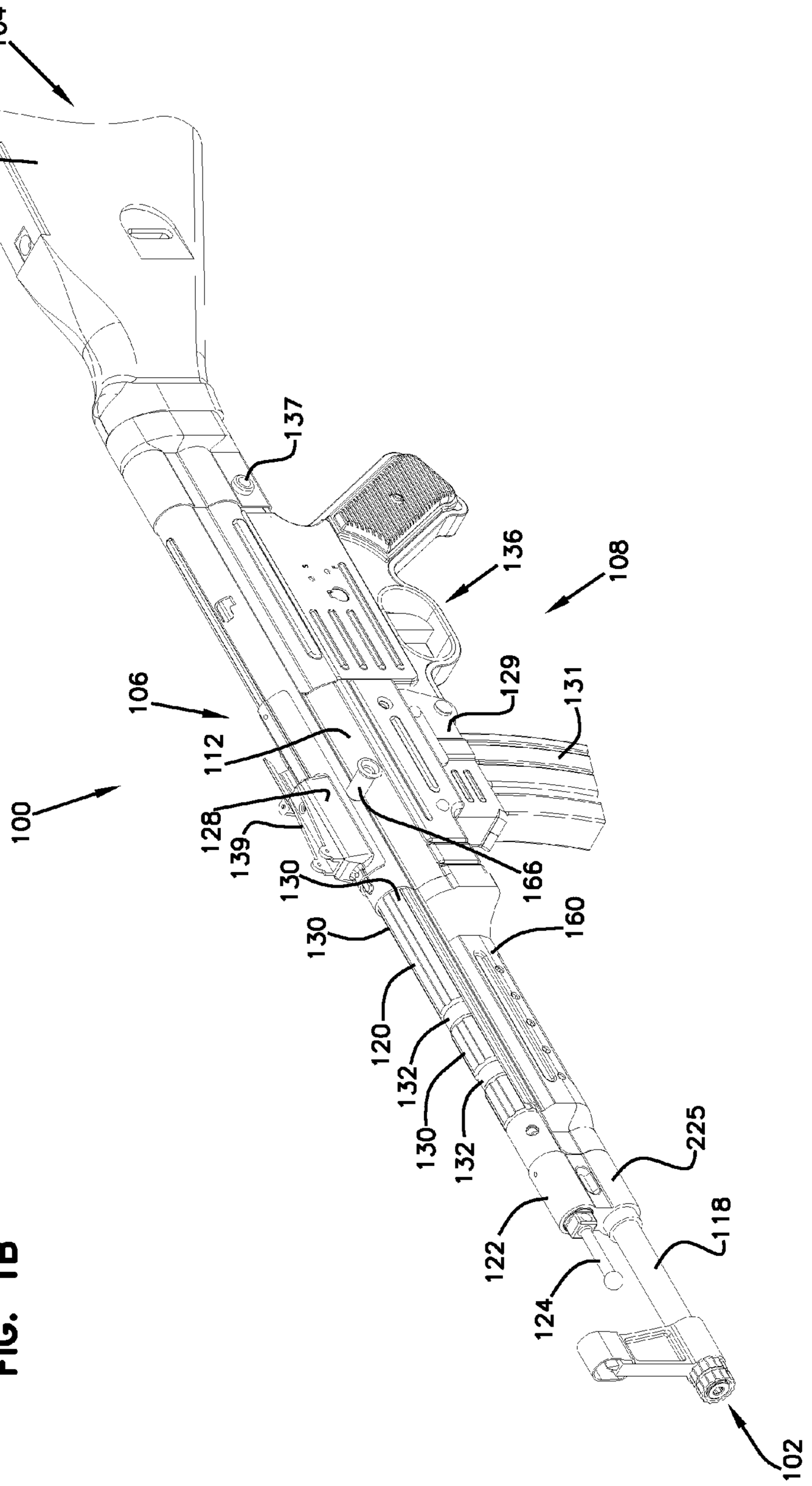
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FIG. 1B

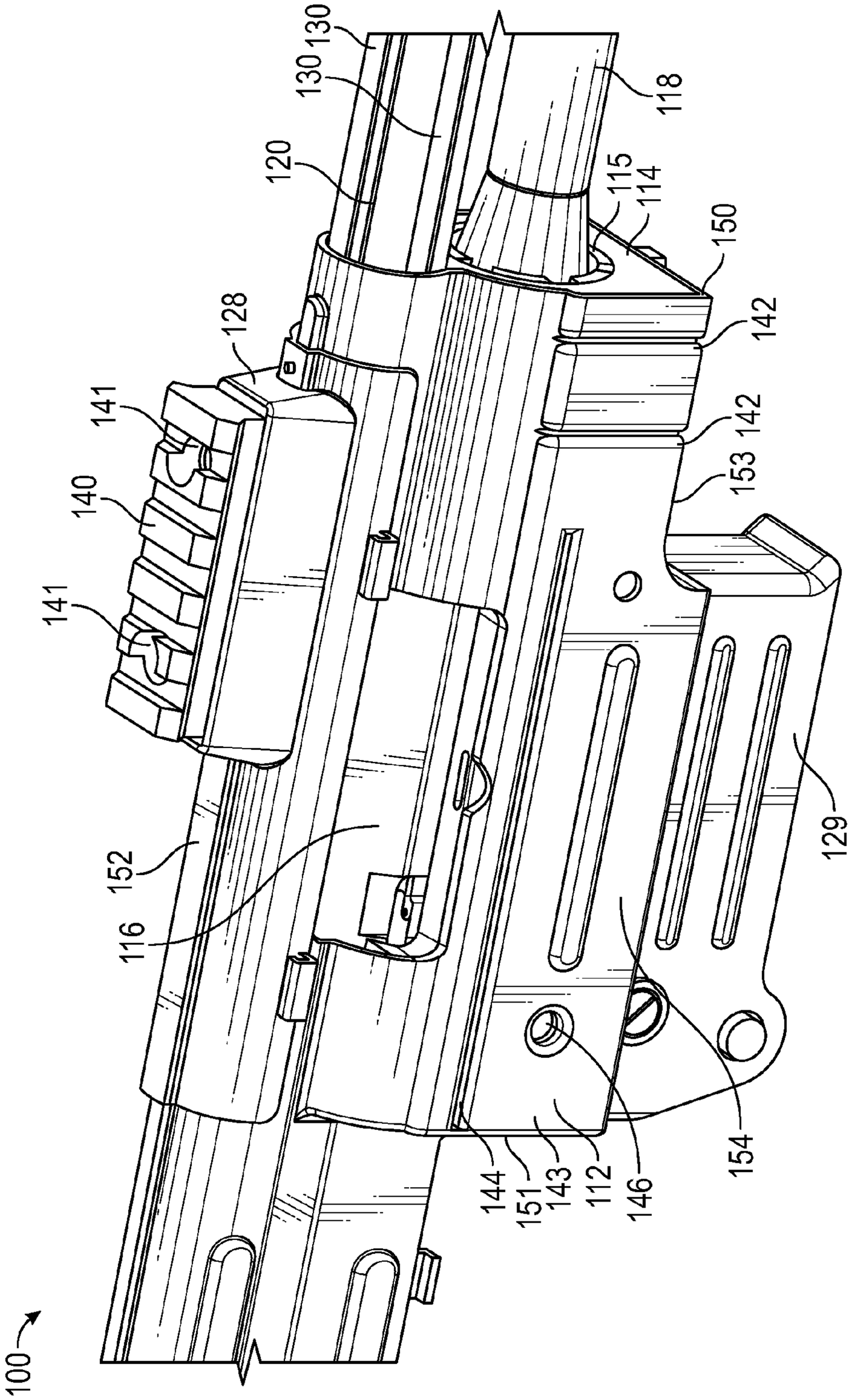
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FIG. 2

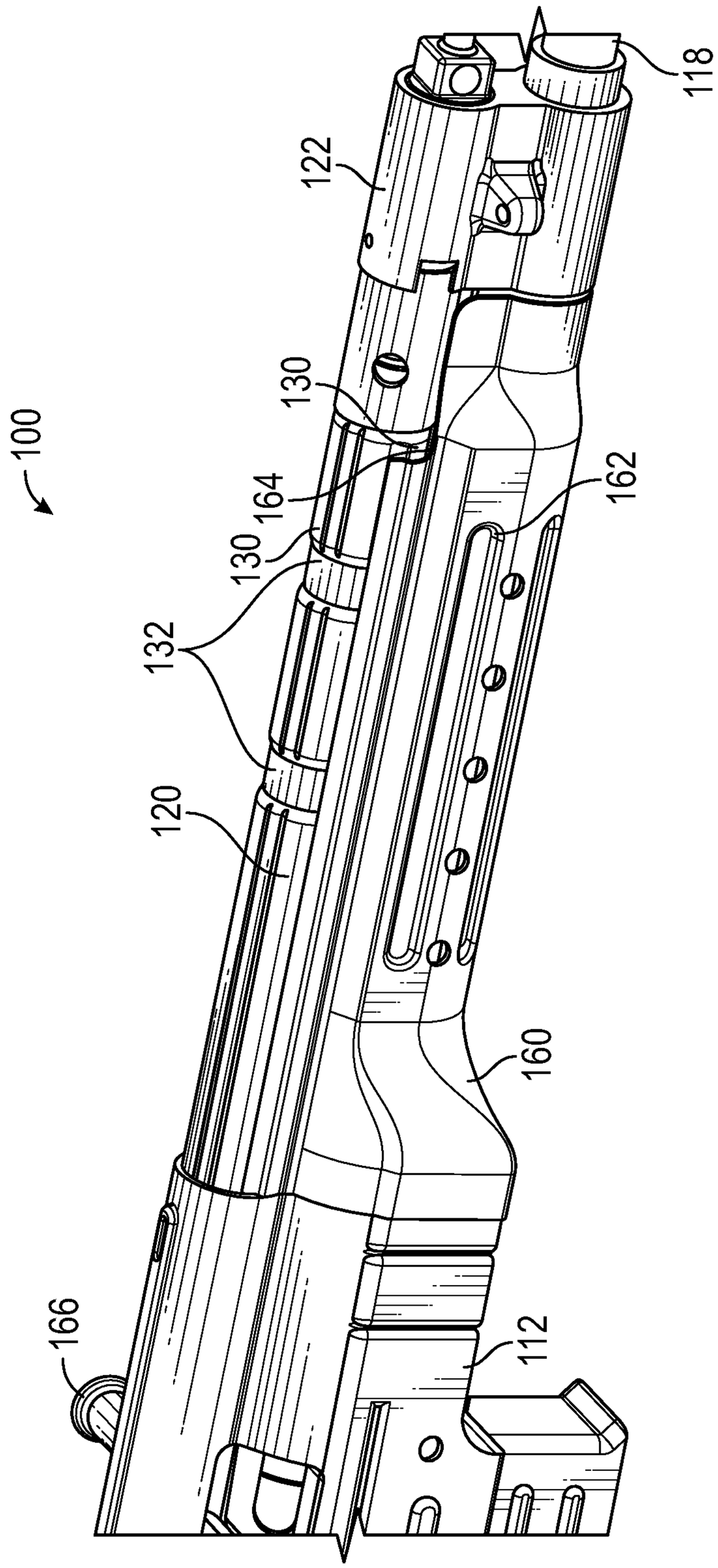

FIG. 3

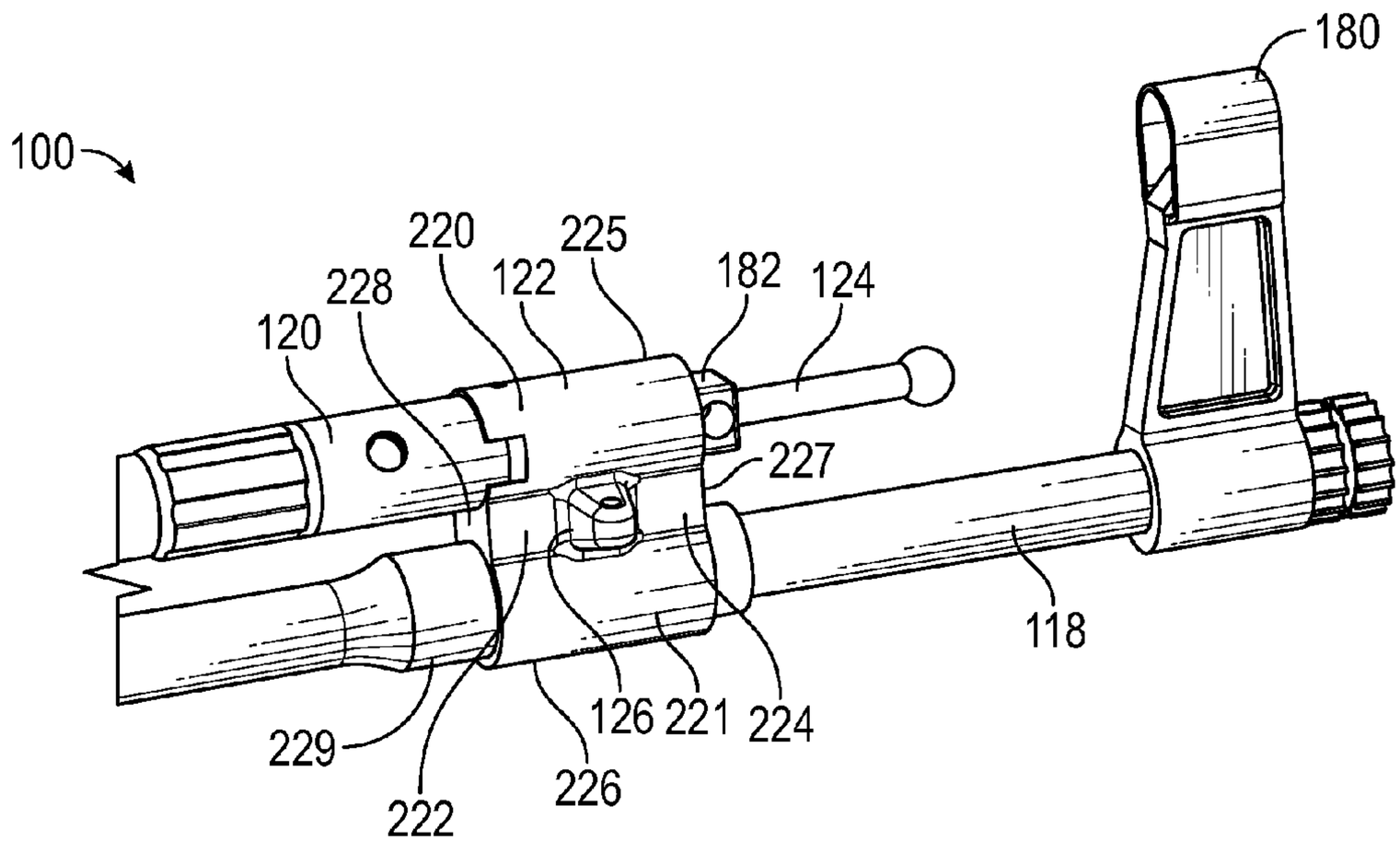
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FIG. 4A

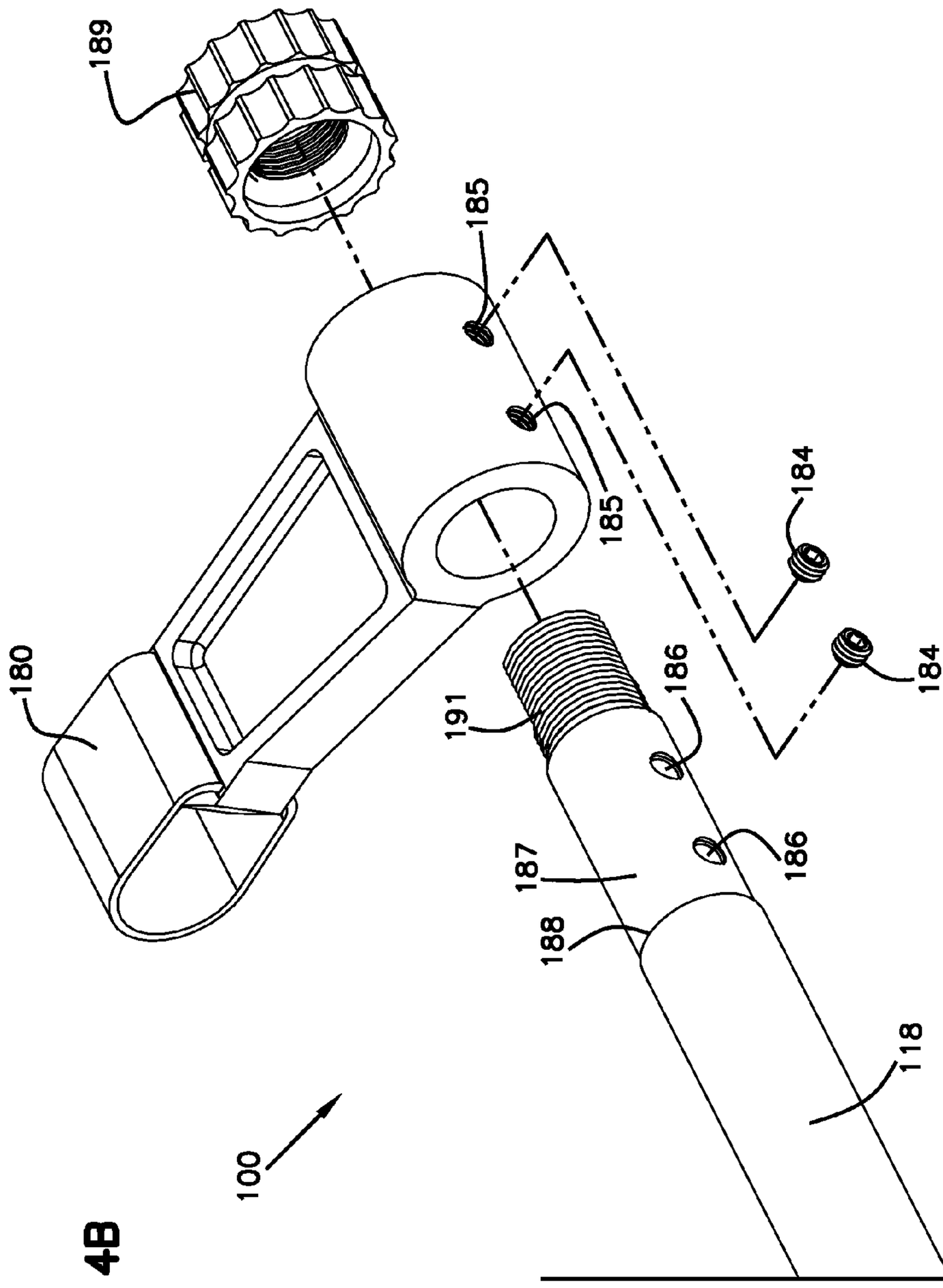
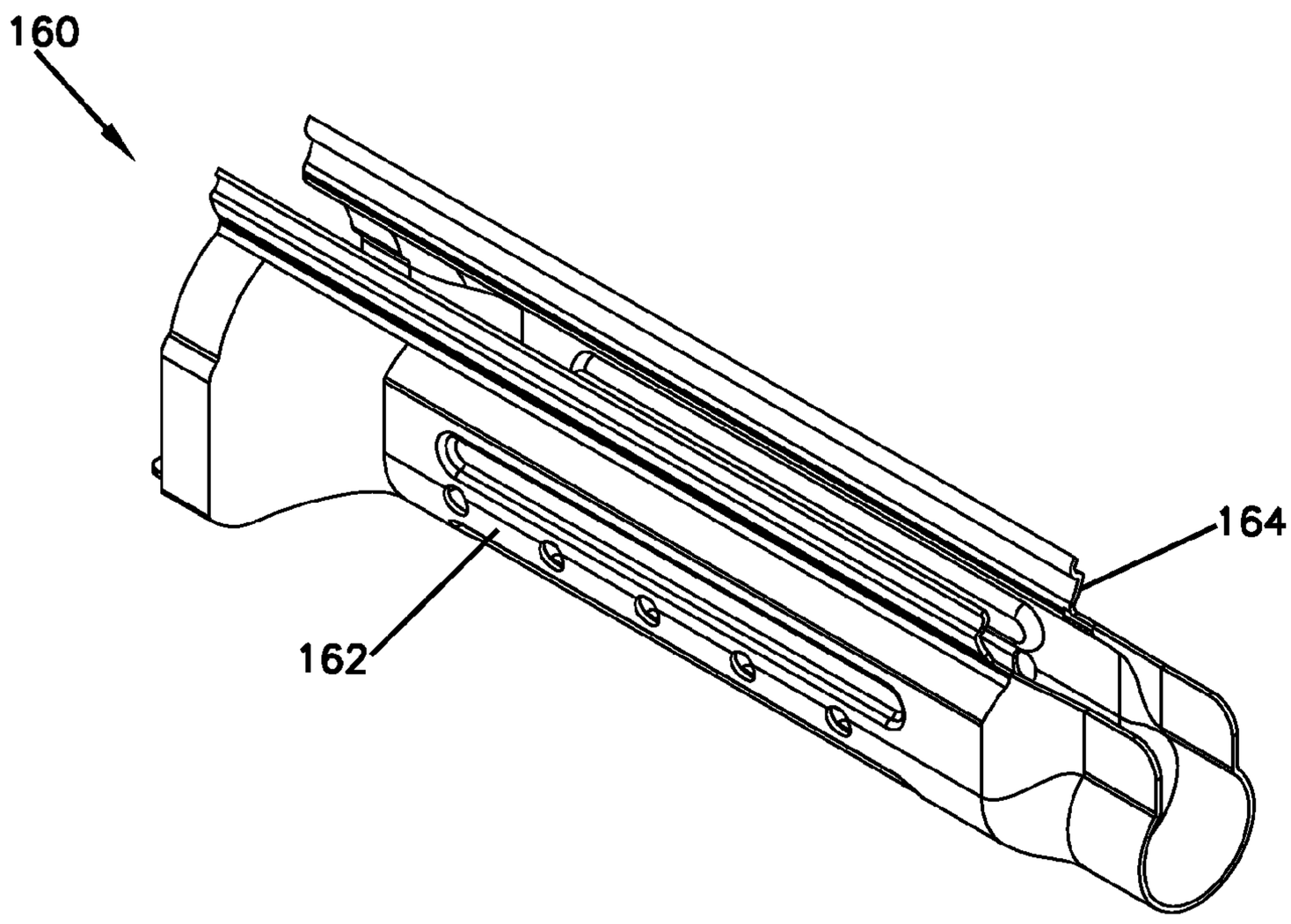


FIG. 4B

FIG. 5



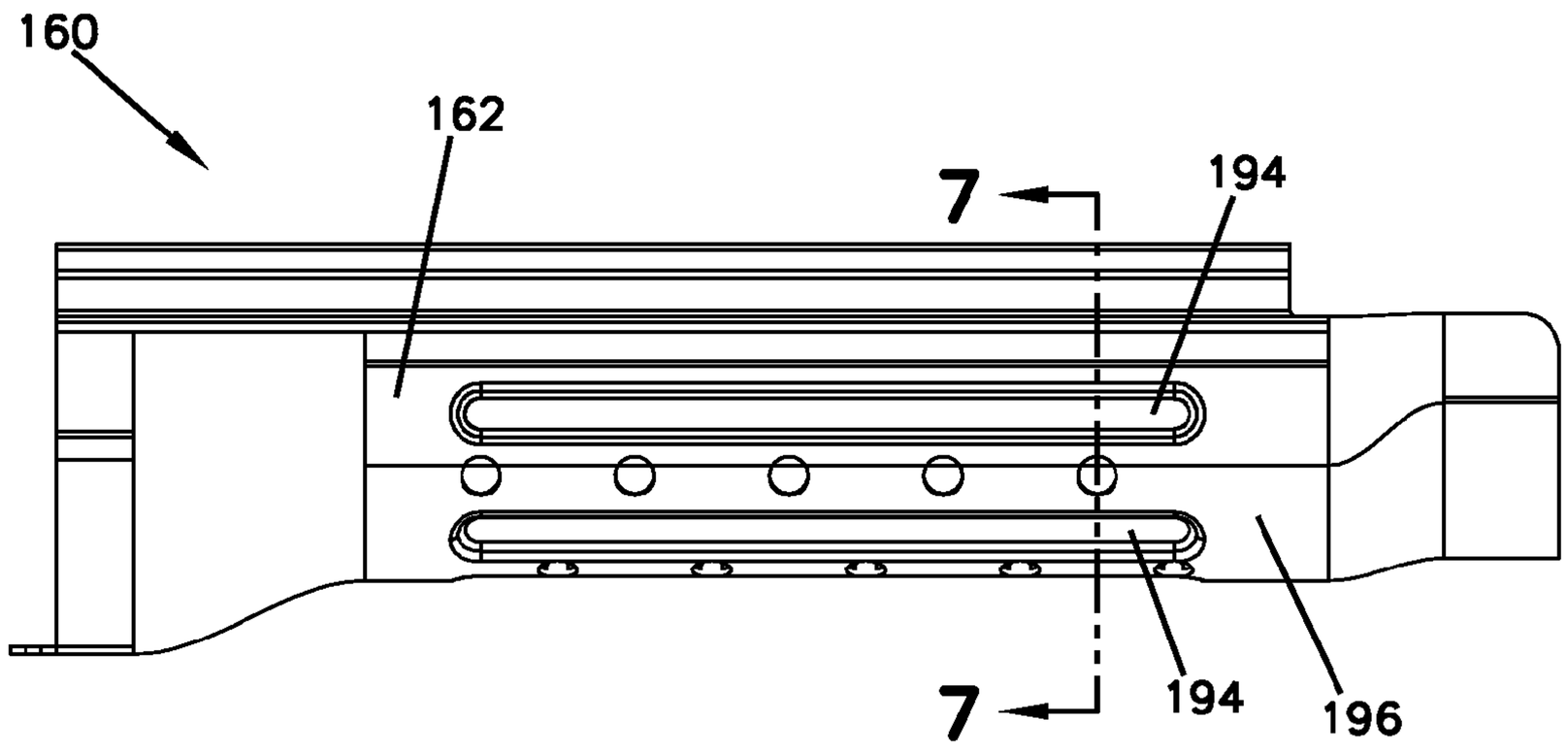
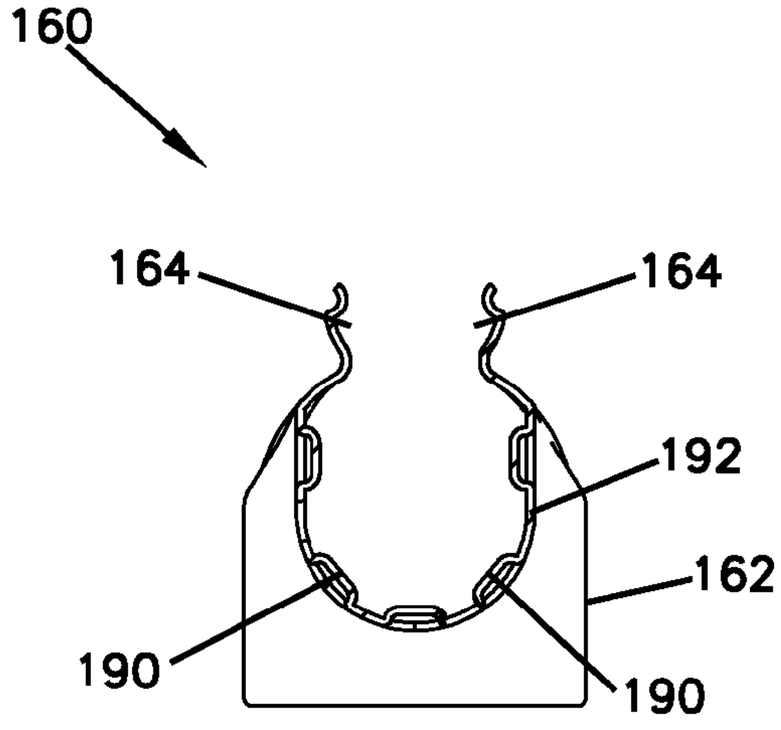


FIG. 6



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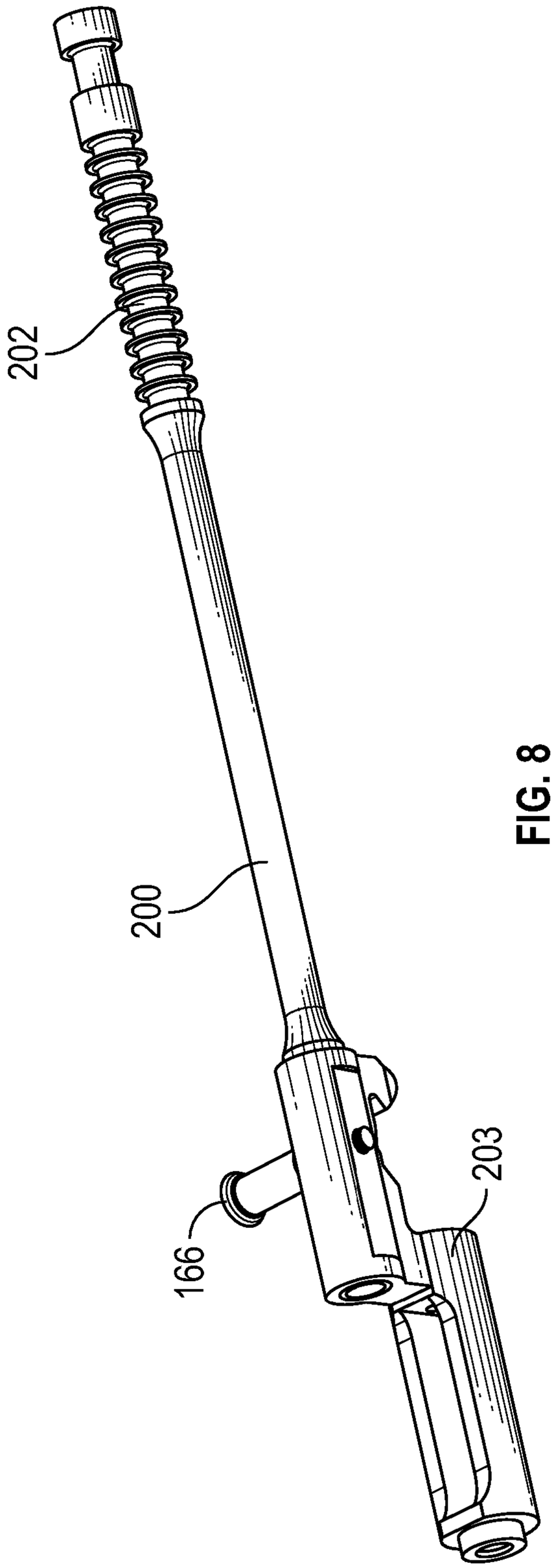

FIG. 8

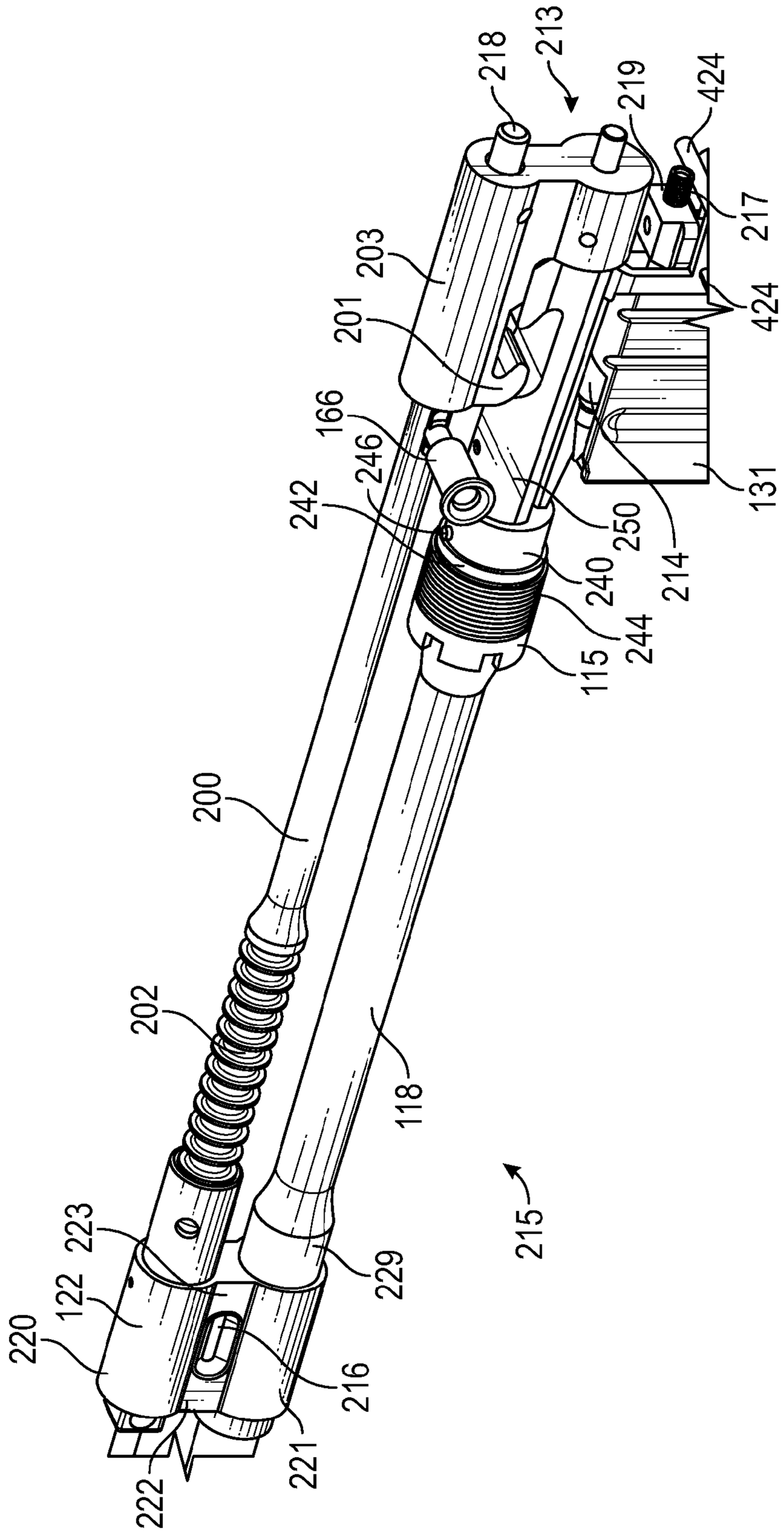
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FIG. 9

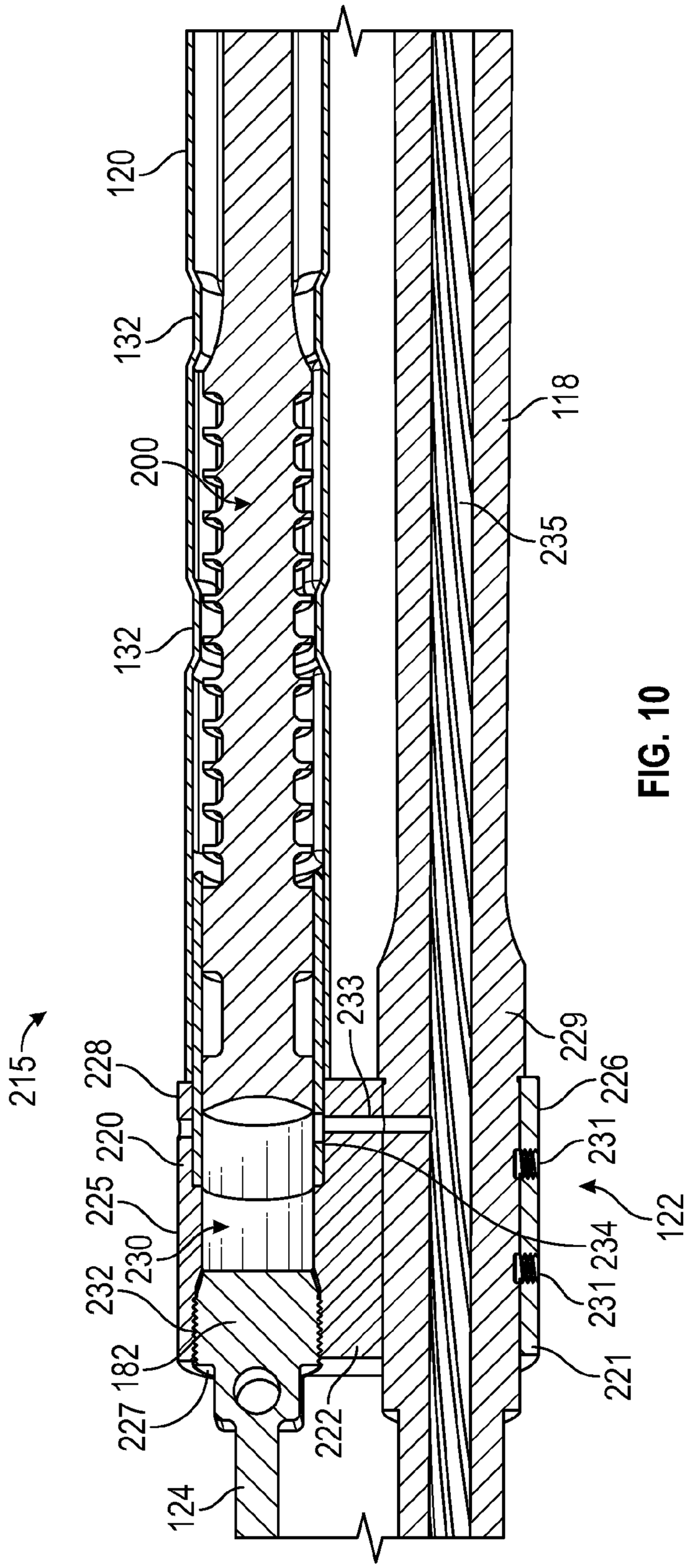
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FIG. 10

FIG. 11A

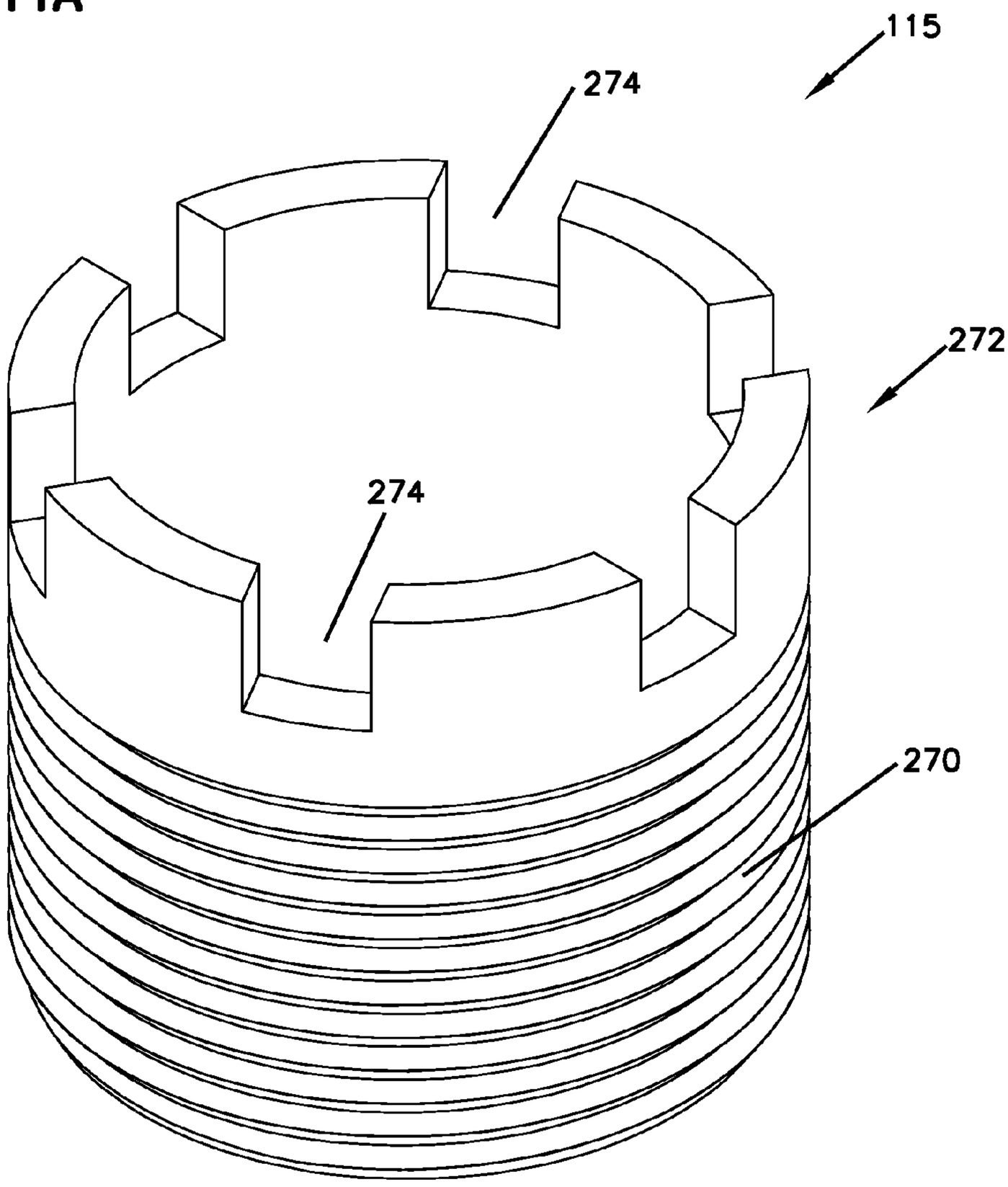


FIG. 11B

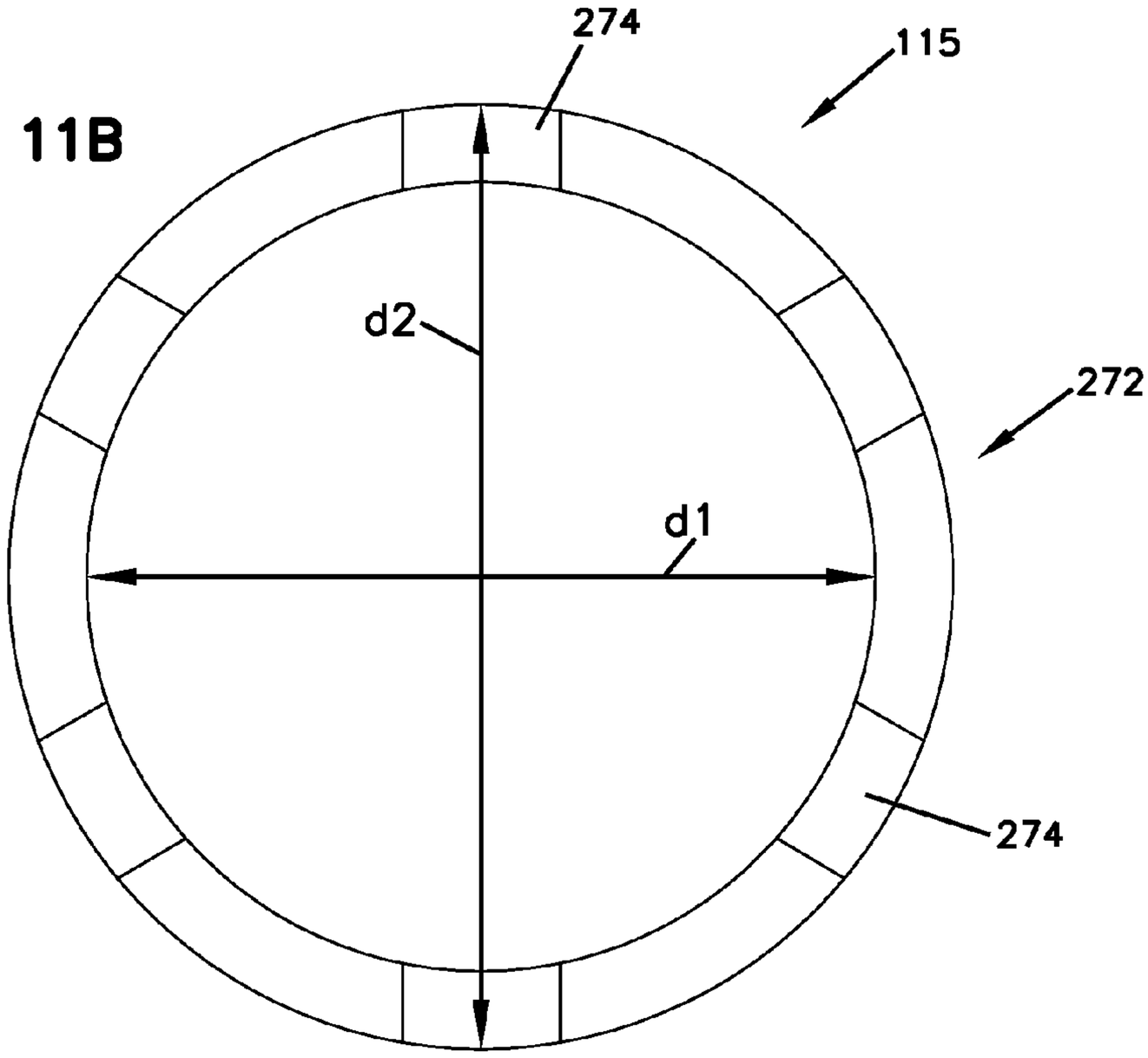
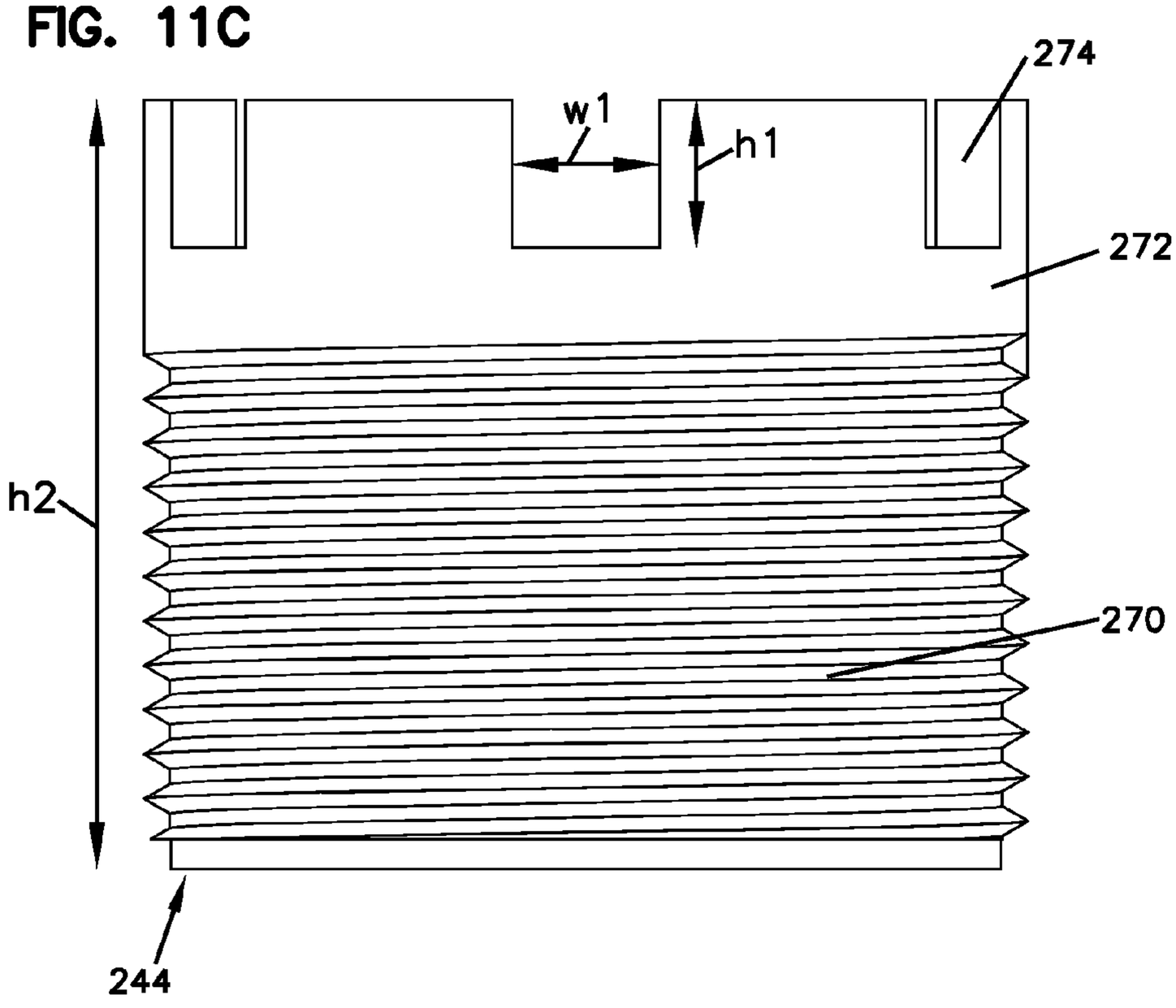


FIG. 11C



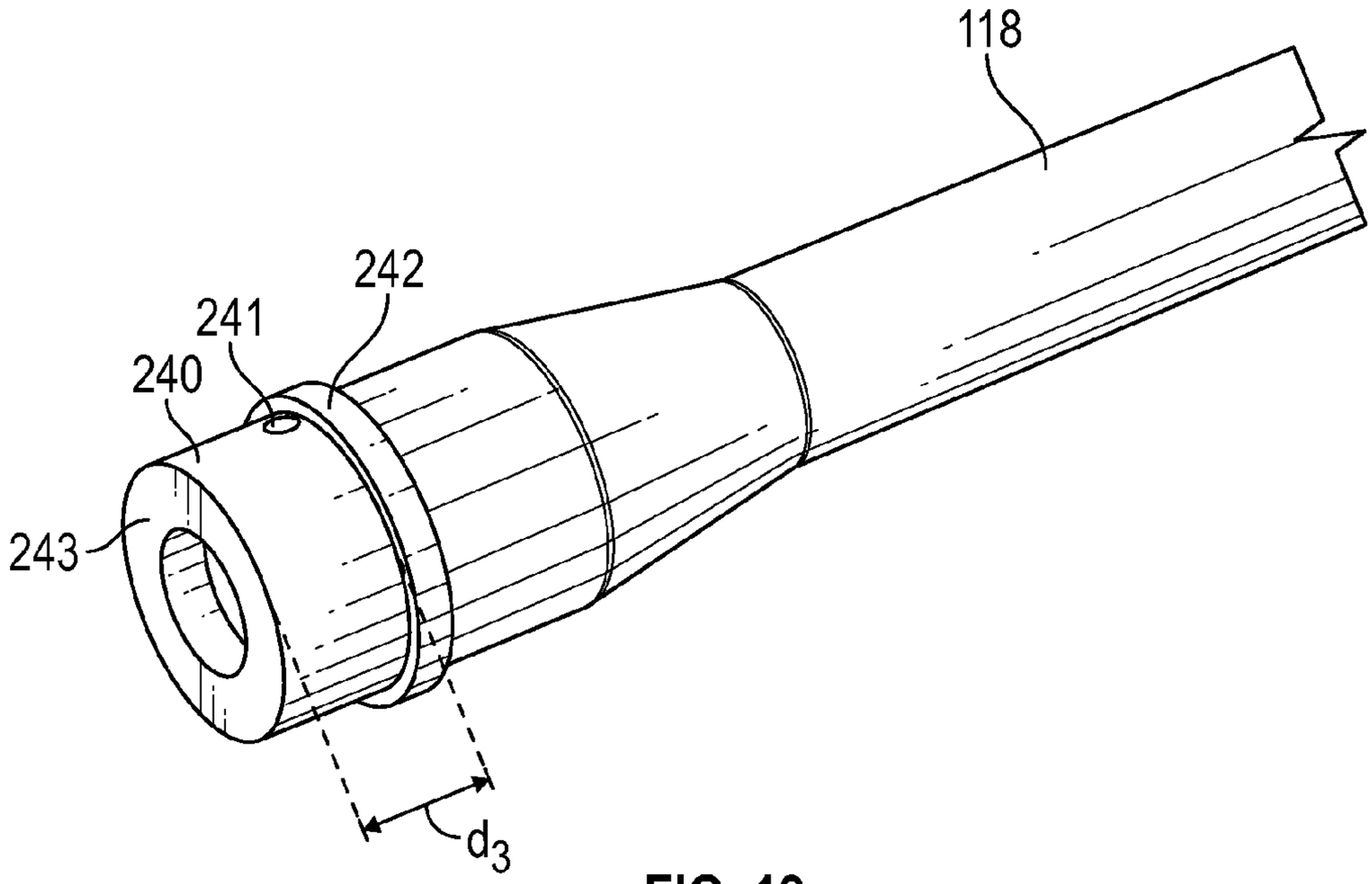


FIG. 12

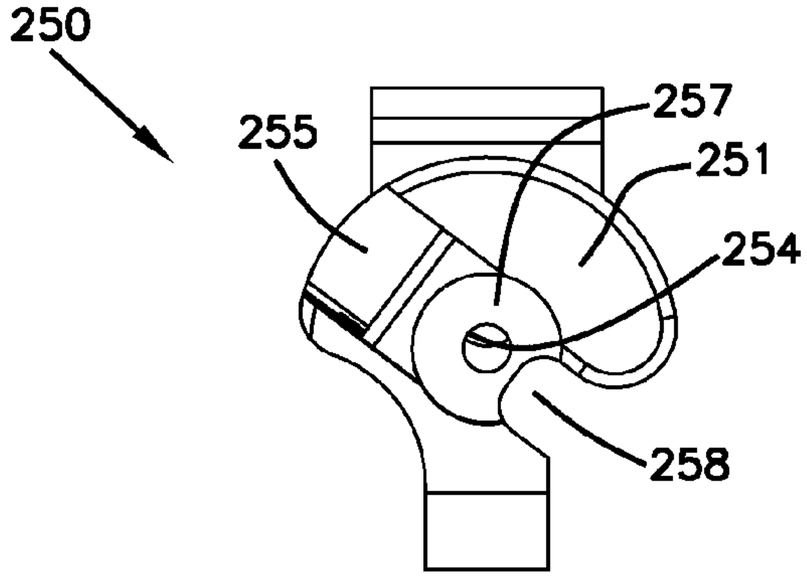


FIG. 13

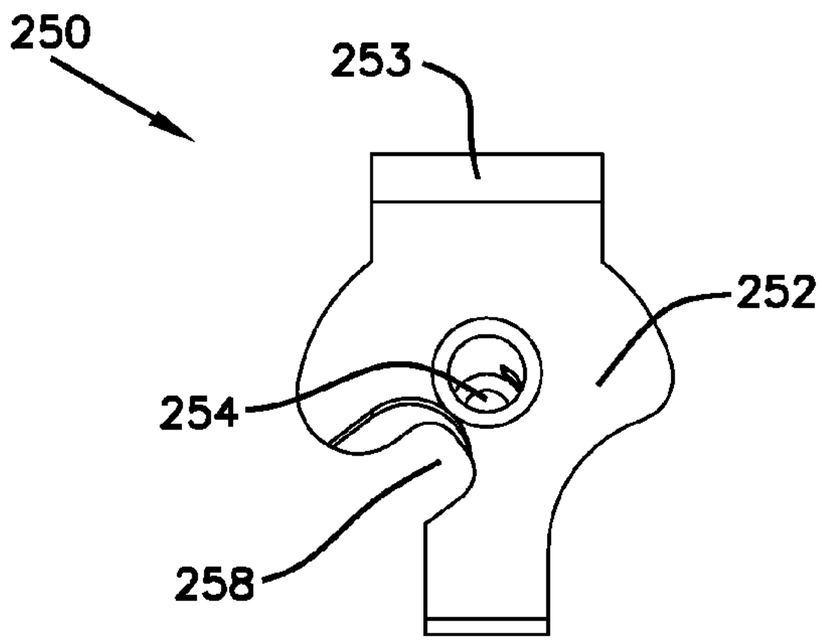


FIG. 14

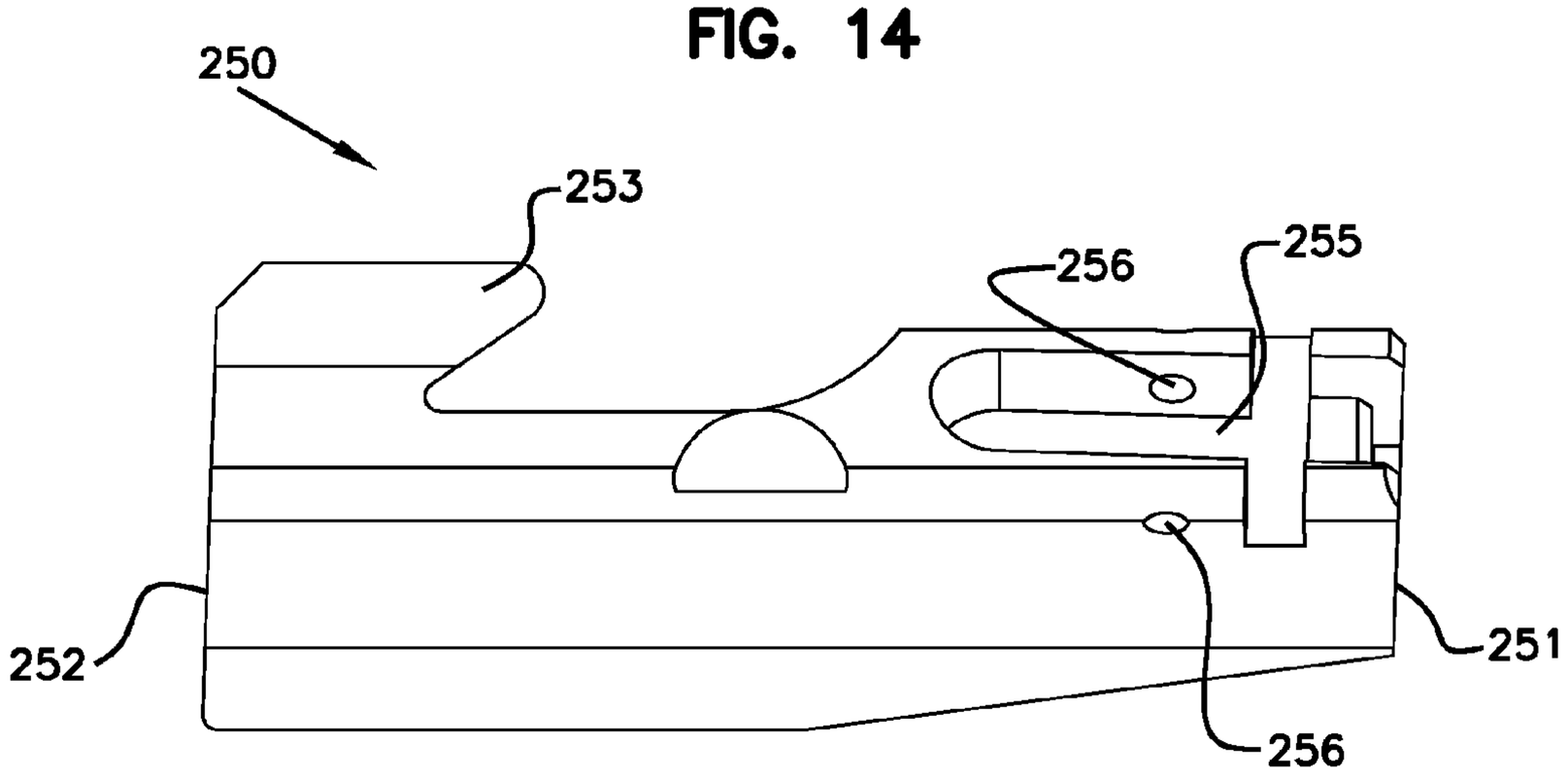


FIG. 15

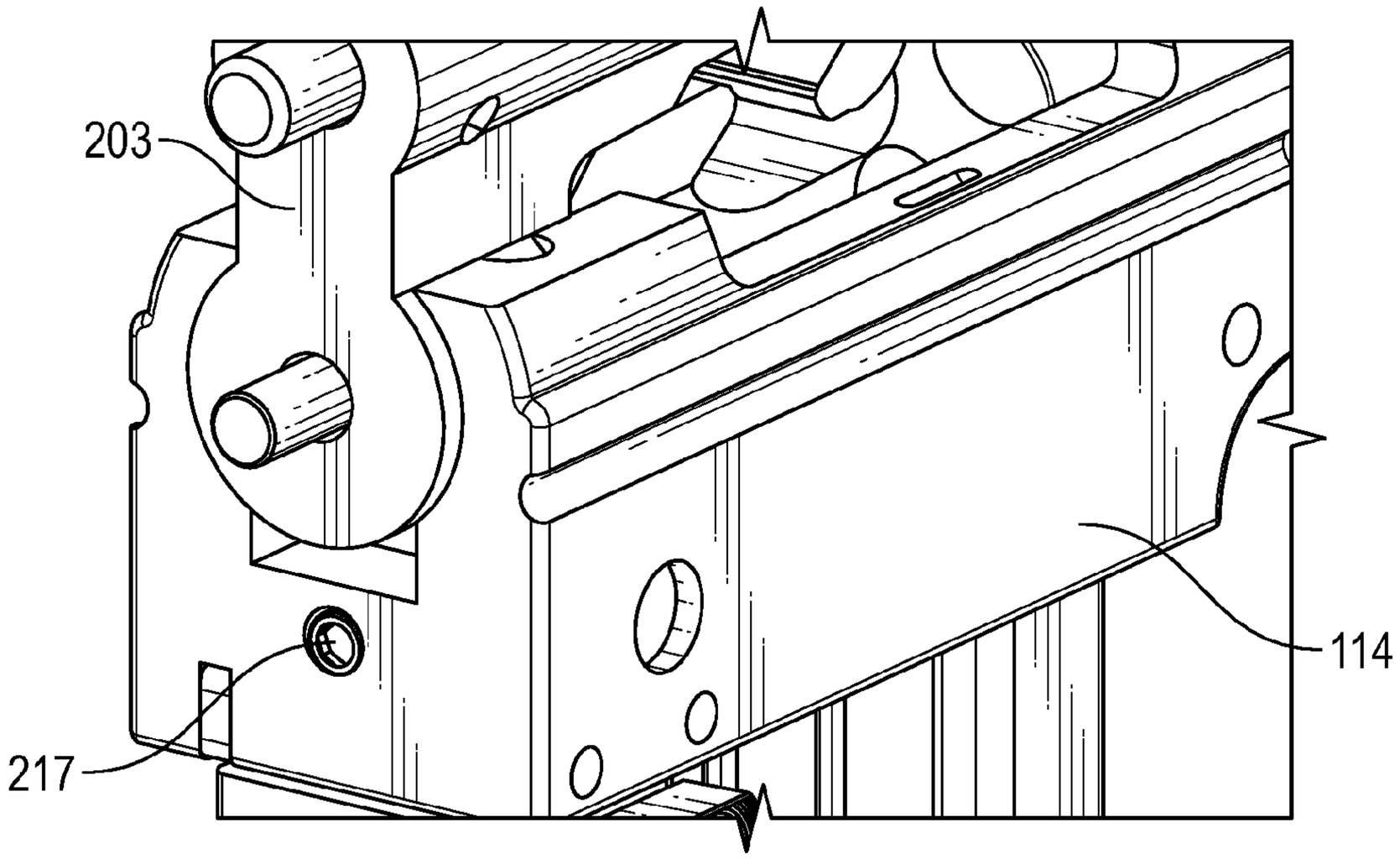


FIG. 16

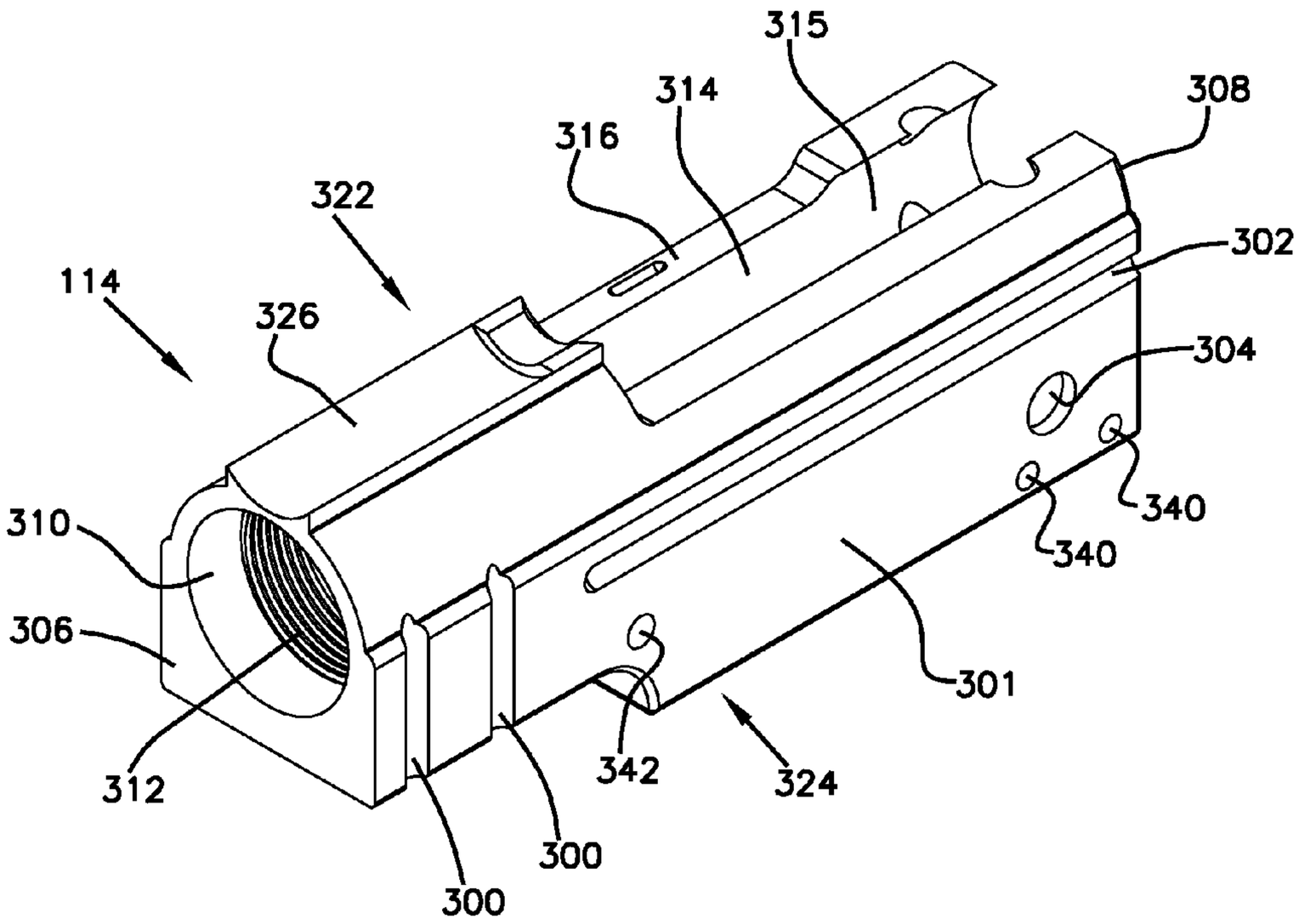

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FIG. 17

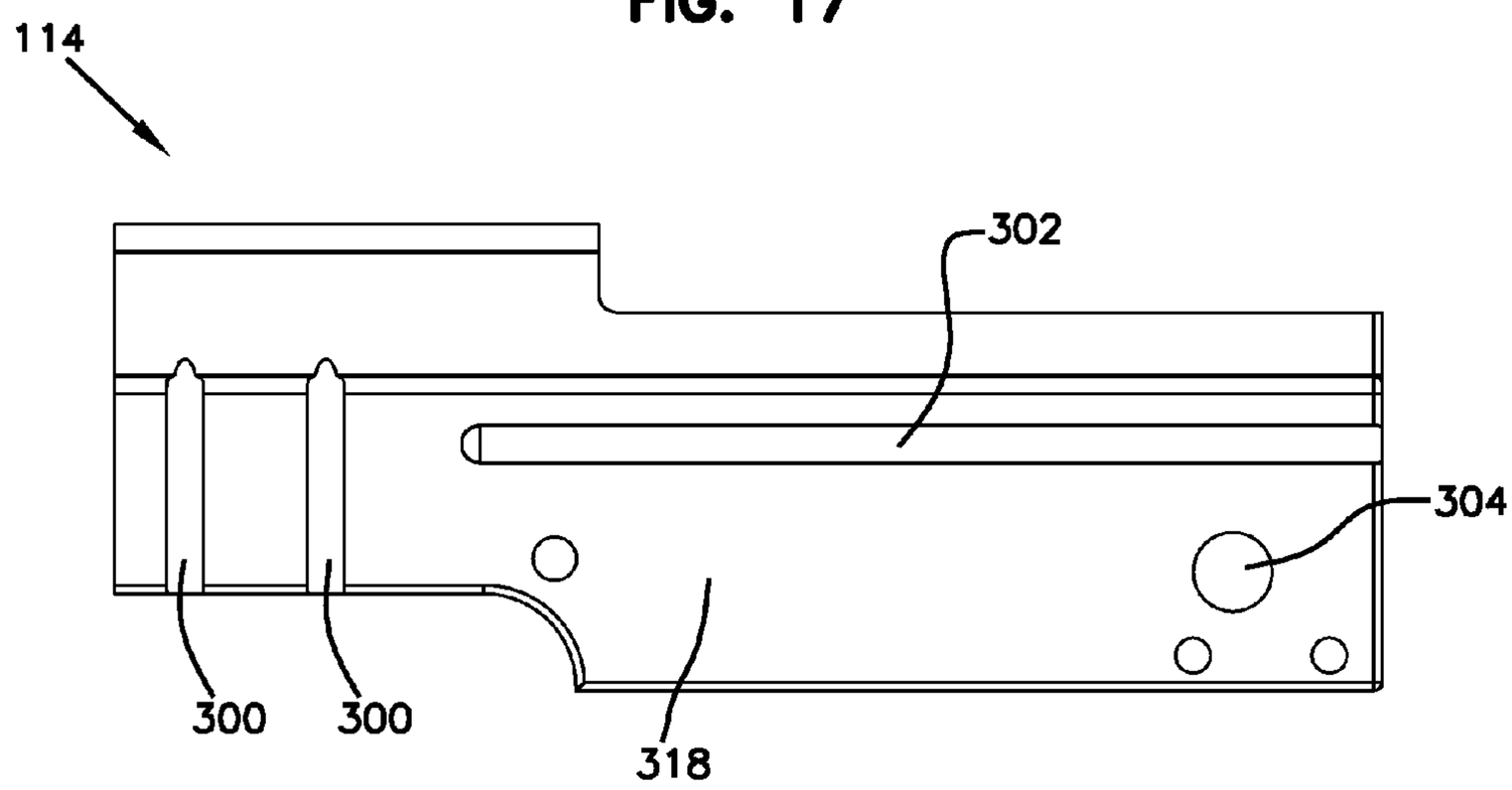
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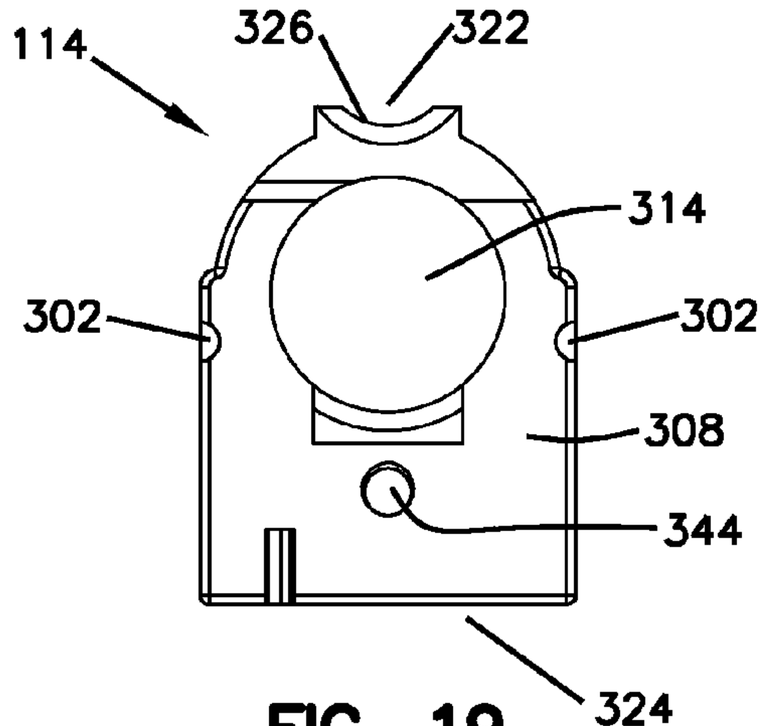
FIG. 18



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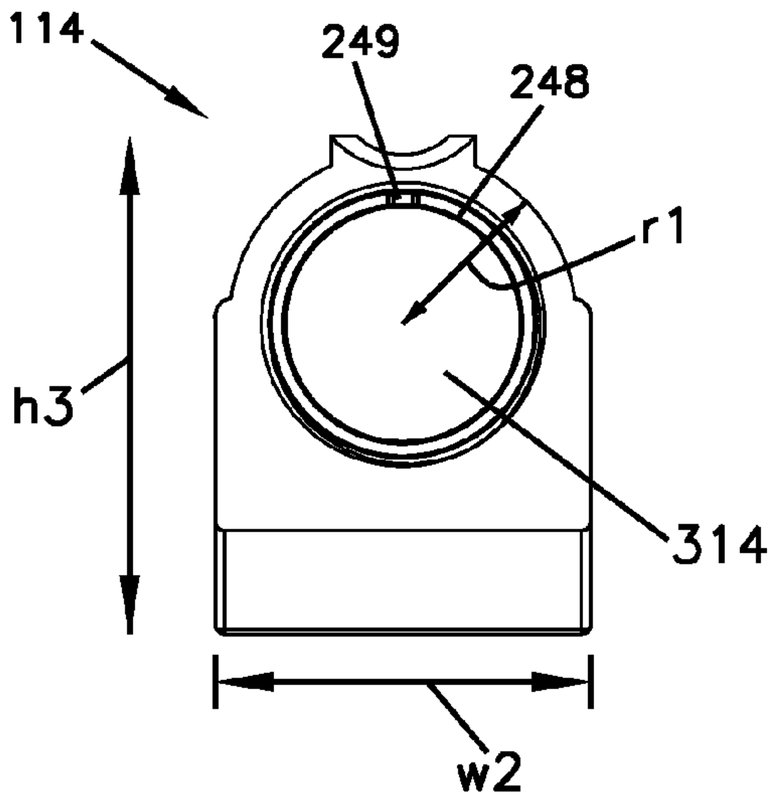

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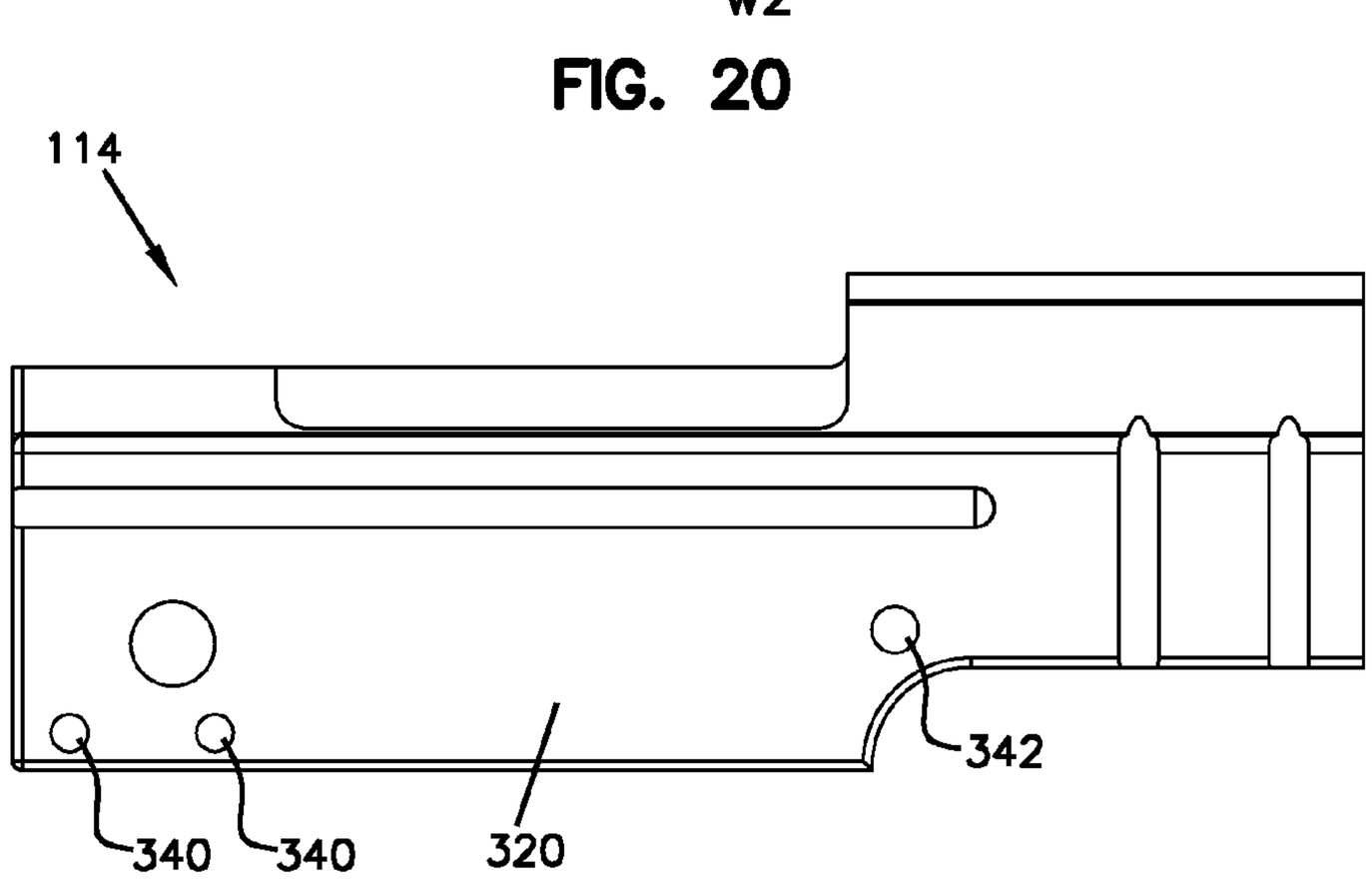

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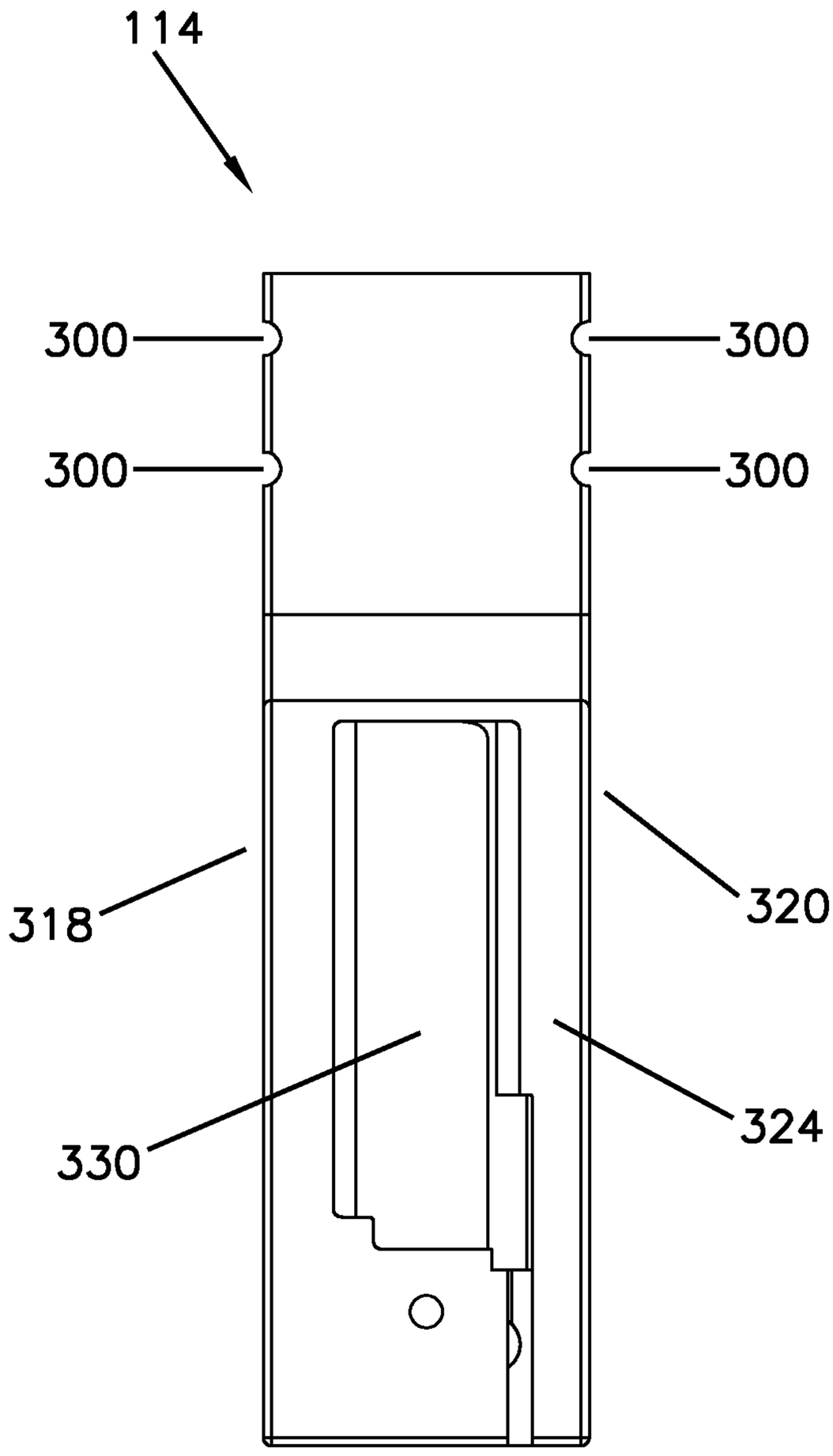


FIG. 22

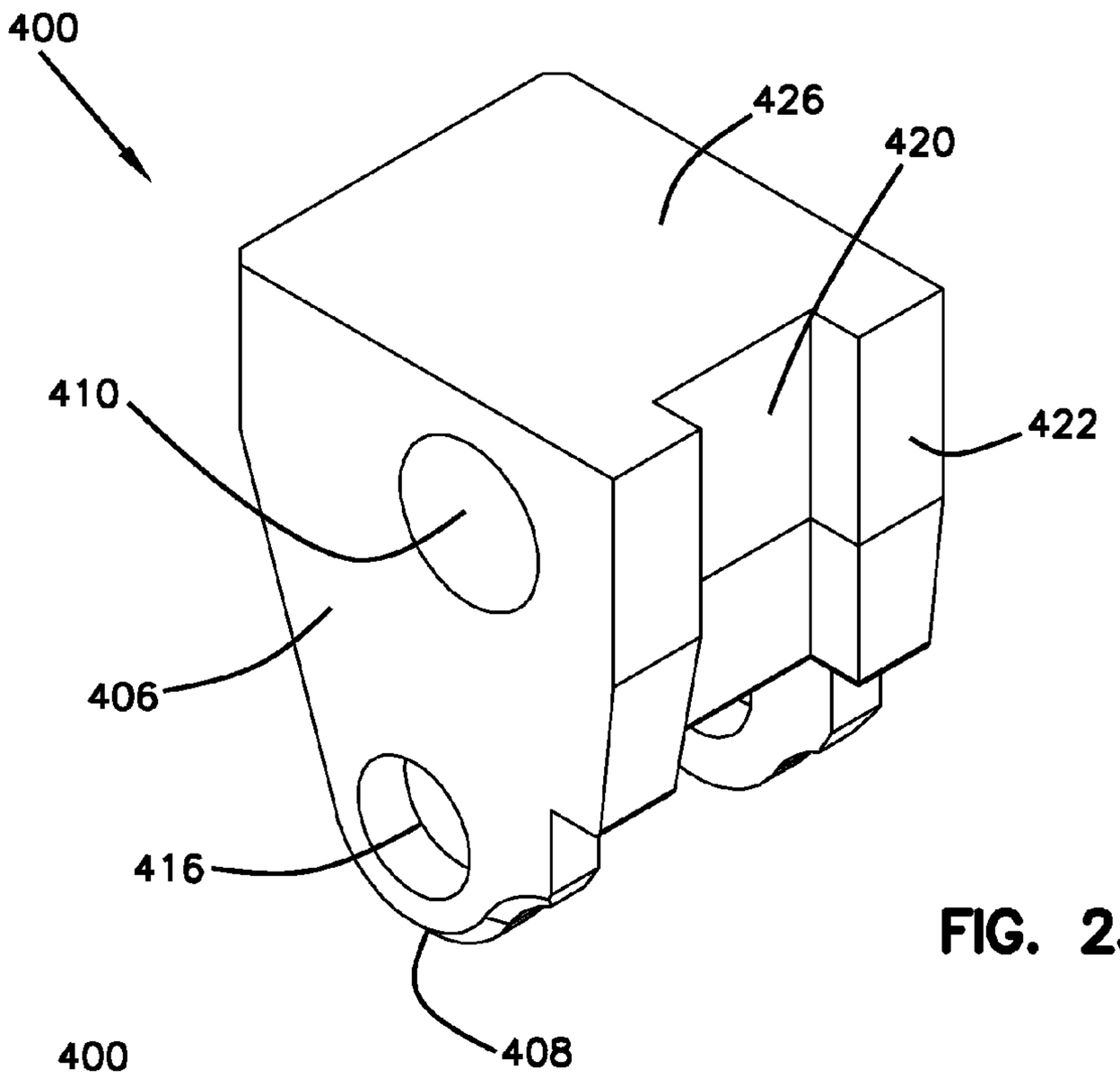
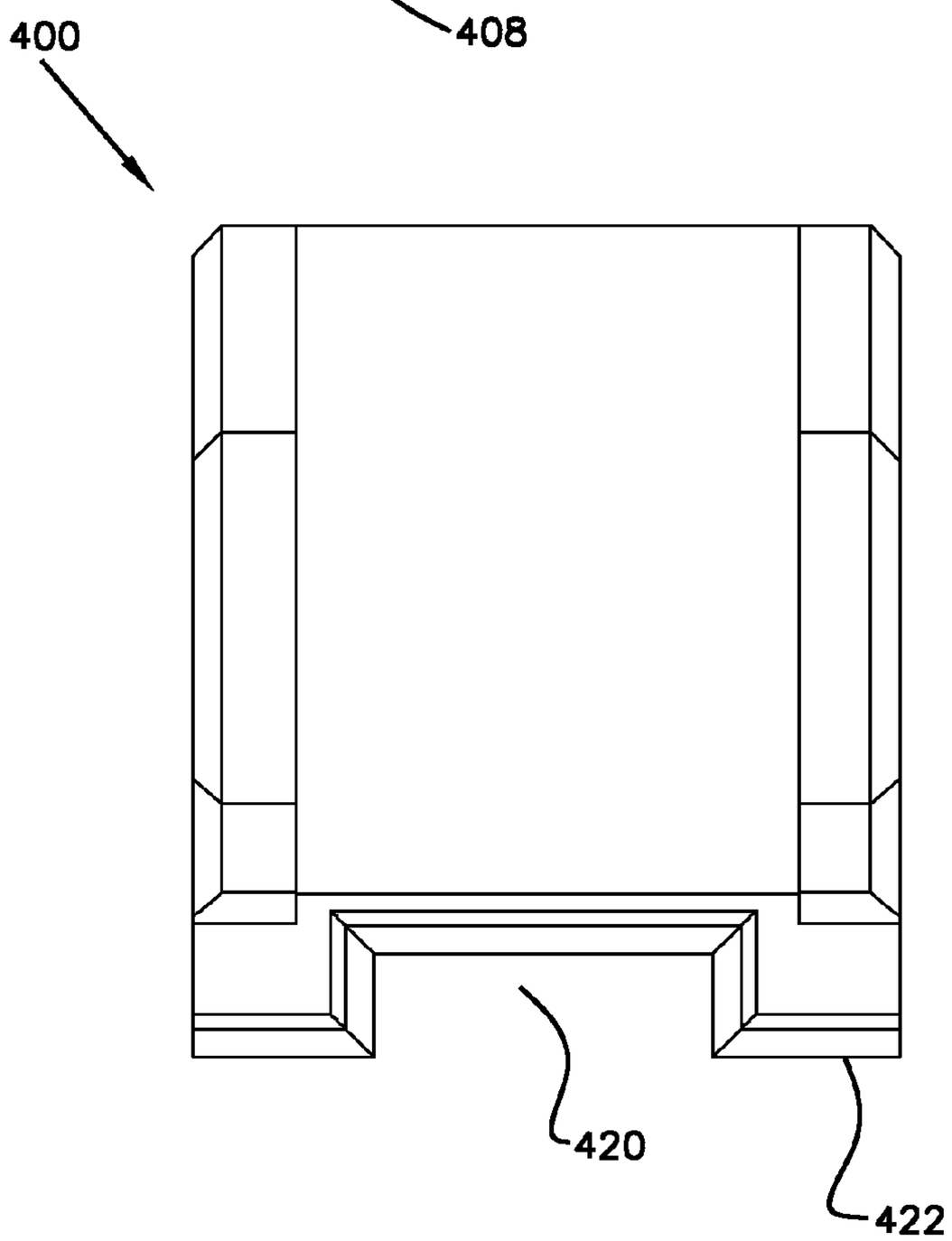


FIG. 23



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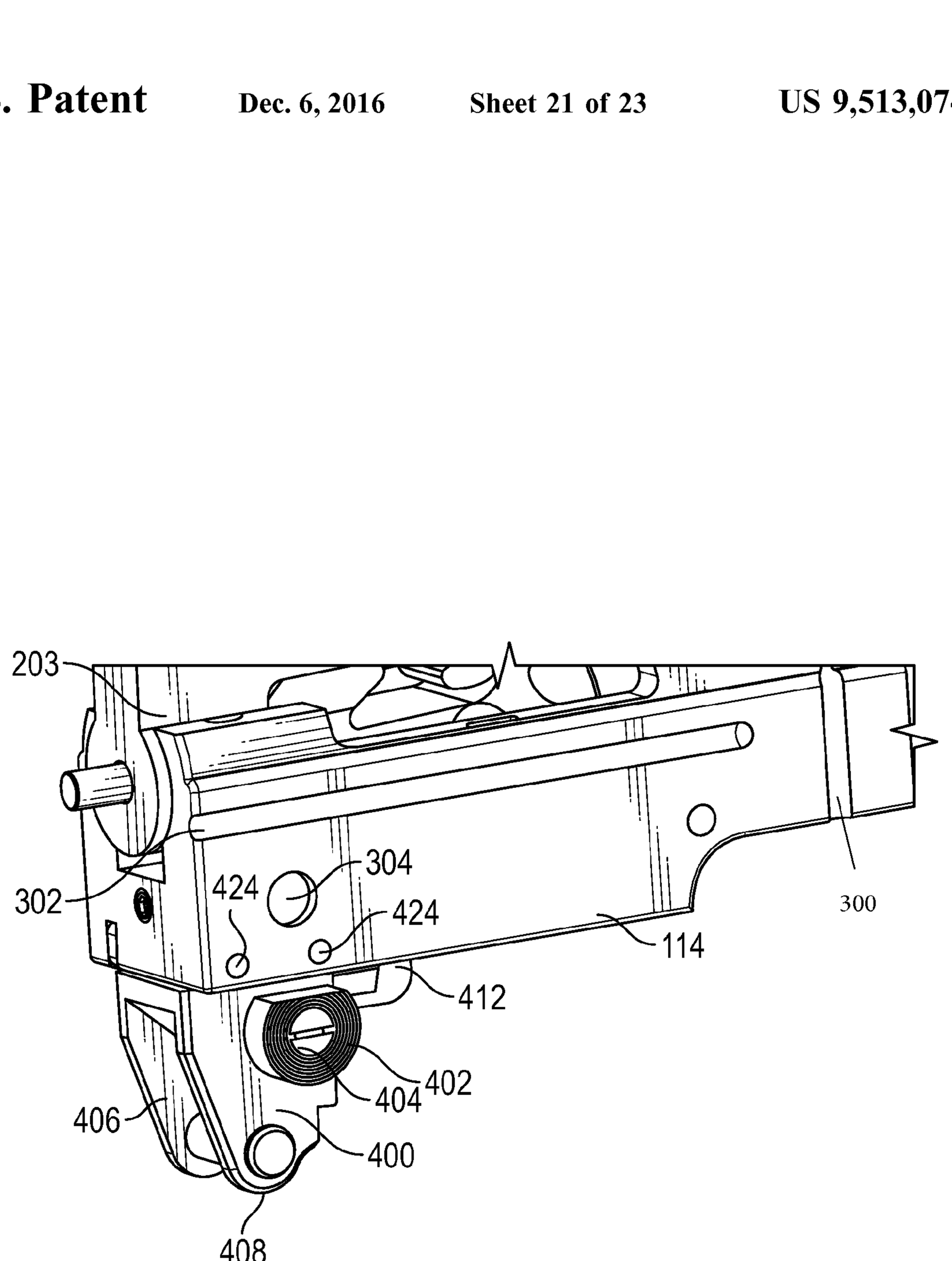
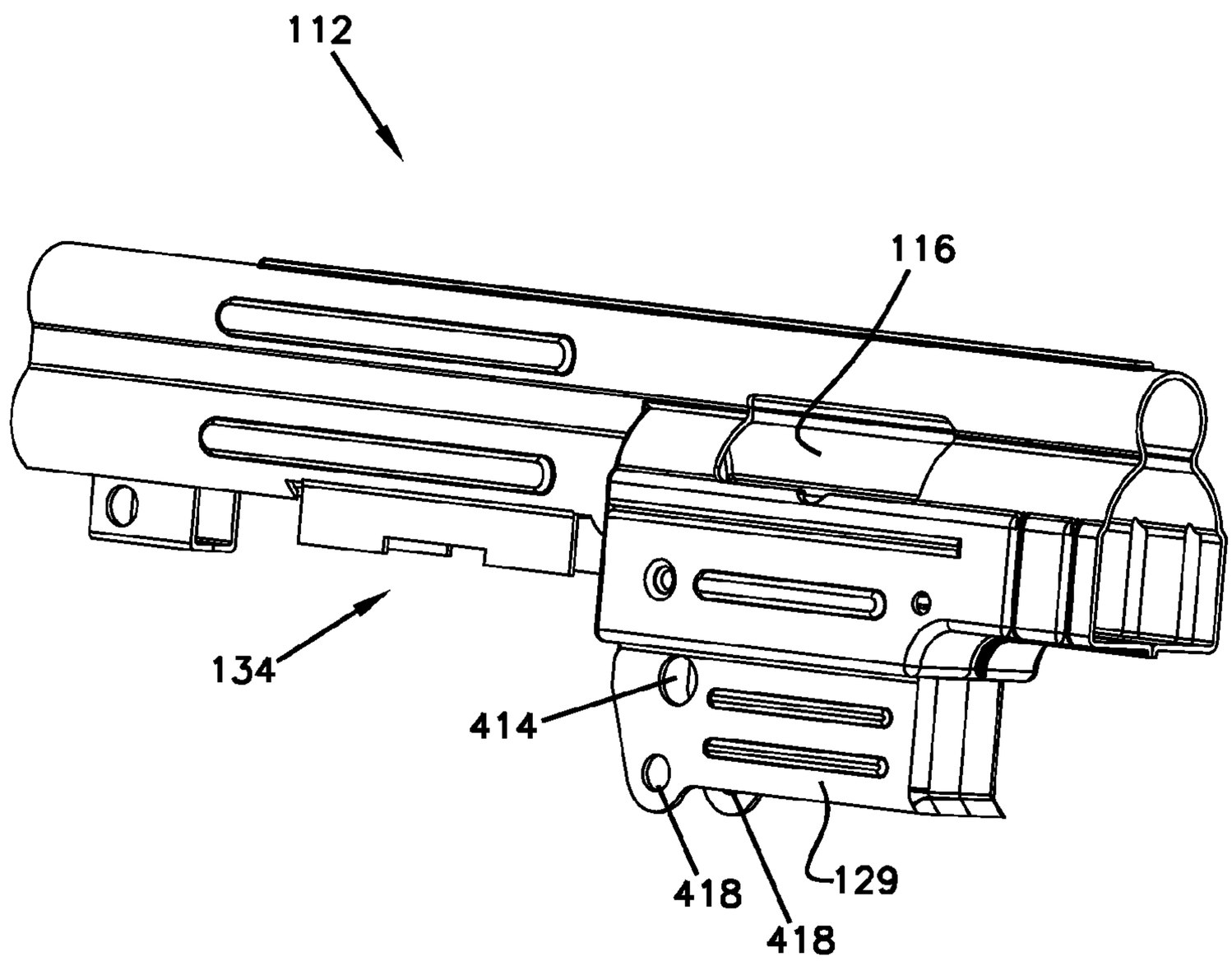


FIG. 25

FIG. 26



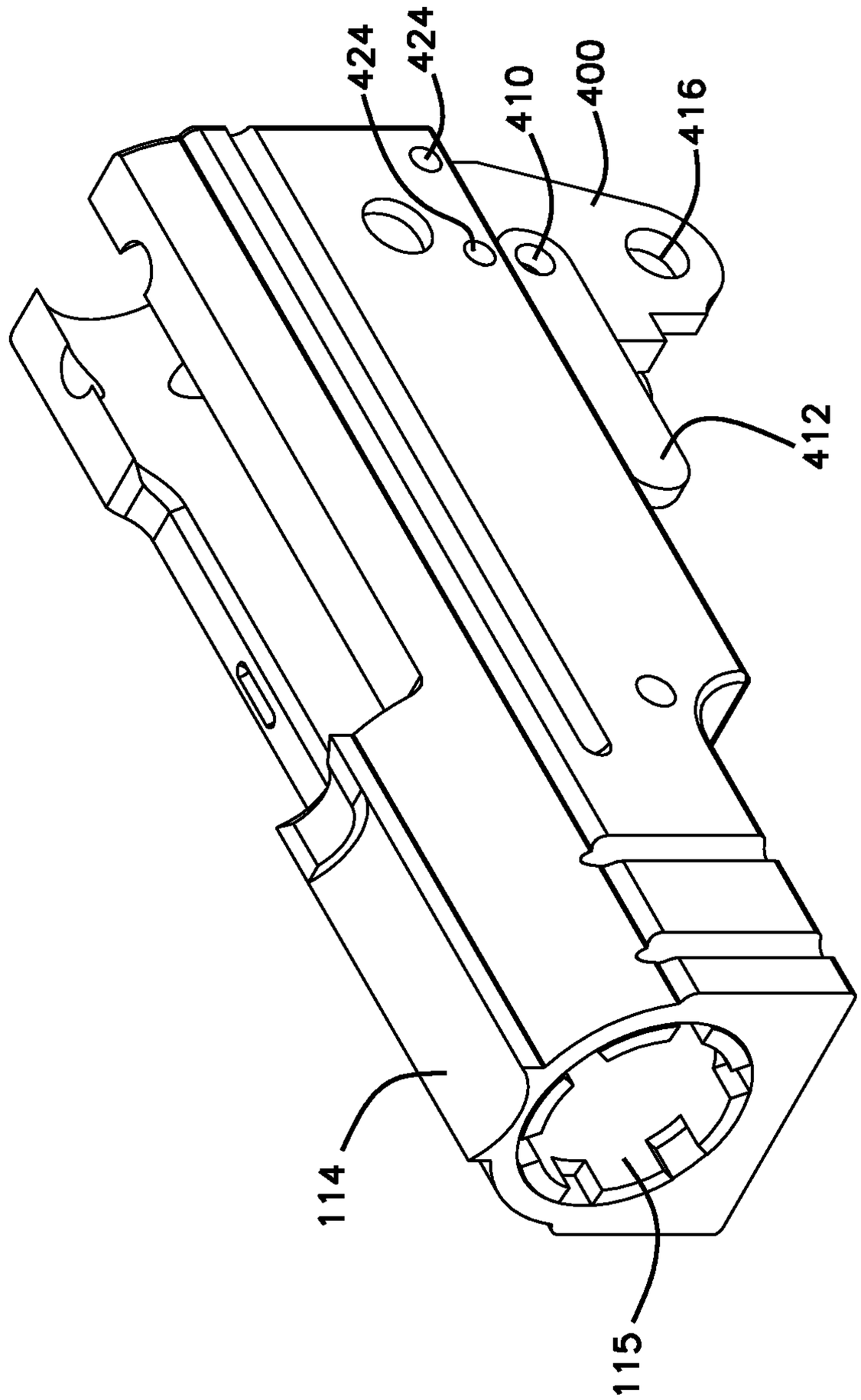


FIG. 27

FIREARM WITH INTERCHANGEABLE PARTS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of priority to U.S. Provisional Patent Application No. 62/169,136 filed Jun. 1, 2015, the disclosure of which is hereby incorporated by reference in its entirety.

BACKGROUND

Modern firearms present many advantages over their outdated and, in many instances, obsolete predecessors. However, outdated or "legacy" firearms still hold appeal for many reasons, such as their methods of operation and their look and feel. Thus there is a need for modernized legacy firearms that maintain recognizable utilitarian and/or aesthetic features of a legacy firearm.

SUMMARY

The present disclosure relates generally to a new firearm comprising a plurality of legacy components as well as one or more features that enable interchangeability of firearm components.

In one aspect, a firearm comprises a barrel, a barrel nut, and a trunnion mated with a receiver, the barrel nut and barrel being removably coupled to the receiver, wherein the outer surface of the trunnion on each of the left side and the right side comprises a conical depression, two parallel vertically oriented elongated recesses disposed towards the front face of the trunnion and extending upwardly from the bottom of the trunnion, and a horizontally oriented elongated recess disposed behind the two vertically oriented elongated recesses and above the conical depression, the horizontally oriented elongated recess extending forwardly from the rear face of the trunnion, and wherein one or more components of the firearm is/are configured to be swapped with components of another model firearm.

In another aspect, a firearm comprises a bolt block comprising a set screw for adjusting the position of the bolt block and a trunnion, wherein the outer surface of the trunnion on each of the left side and the right side comprises a conical depression, two parallel vertically oriented elongated recesses disposed towards the front face of the trunnion and extending upwardly from the bottom of the trunnion, and a horizontally oriented elongated recess disposed behind the two vertically oriented elongated recesses and above the conical depression, the horizontally oriented elongated recess extending forwardly from the rear face of the trunnion.

In a further aspect, a firearm comprises a magazine retention block disposed below a trunnion, wherein the outer surface of the trunnion on each of the left side and the right side comprises a conical depression, two parallel vertically oriented elongated recesses disposed towards the front face of the trunnion and extending upwardly from the bottom of the trunnion, and a horizontally oriented elongated recess disposed behind the two vertically oriented elongated recesses and above the conical depression, the horizontally oriented elongated recess extending forwardly from the rear face of the trunnion.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1**A is a perspective view of a portion of an example firearm in accordance with one embodiment of the present disclosure.

FIG. **1**B is a perspective view of a further portion of an example firearm in accordance with the embodiment of FIG. **1**A.

FIG. **2** is a perspective view of a first portion of the firearm of FIG. **1**.

FIG. **3** is a perspective view of a second portion of the firearm of FIG. **1** including a mounted example handgrip.

FIG. **4**A is a perspective view of a third portion of the firearm of FIG. **1**.

FIG. **4**B is a bottom perspective exploded view of a front side portion of FIG. **4**A.

FIG. **5** is a perspective view of the firearm handgrip shown in FIG. **3**.

FIG. **6** is a right side view of the firearm handgrip shown in FIG. **3**.

FIG. **7** is a cross-sectional view of the handgrip **160** of FIG. **3** along the line A-A in FIG. **6**.

FIG. **8** is a perspective view of an example bolt carrier and gas piston in accordance with the present disclosure.

FIG. **9** is a perspective view of an embodiment of an example barrel assembly and bolt assembly in accordance with the present disclosure.

FIG. **10** is a side cross-sectional view of a portion of the barrel assembly shown in FIG. **9**.

FIG. **11**A is a perspective view of an example barrel nut used with the firearm of FIG. **1**.

FIG. **11**B is a front view of the barrel nut of FIG. **11**A.

FIG. **11**C is a side view of the barrel nut of FIG. **1**.

FIG. **12** is a perspective view of a rear portion of the barrel of the example firearm of FIG. **1**.

FIG. **13** is a front view of an example bolt that can be used with a firearm of the present disclosure.

FIG. **14** is a rear view of the bolt of FIG. **13**.

FIG. **15** is a side view of the bolt of FIG. **13**.

FIG. **16** is a partial rear perspective view of the example trunnion shown in the firearm in FIG. **1**, as well as an example bolt carrier and set screw.

FIG. **17** is a front perspective view of the trunnion shown in the example firearm in FIG.

FIG. **18** is a left side view of the trunnion shown in the example firearm in FIG. **1**.

FIG. **19** is a rear view of the trunnion shown in the example firearm in FIG. **1**.

FIG. **20** is a front view of the trunnion shown in the example firearm in FIG. **1**.

FIG. **21** is a right side view of the trunnion shown in the example firearm in FIG. **1**.

FIG. **22** is a bottom view of the trunnion shown in the example firearm in FIG. **1**.

FIG. **23** is a perspective view of a magazine retention block that can be used in a firearm in accordance with the present disclosure.

FIG. **24** is a bottom view of the magazine retention block of FIG. **23**.

FIG. **25** is a perspective view of a partial firearm assembly including the trunnion shown in the example firearm in FIG. **1** and the magazine retention block shown in FIG. **23**.

FIG. **26** is a perspective view of a portion of firearm receiver in accordance with the present disclosure.

FIG. **27** is a left side perspective view of a trunnion **114**, a barrel nut **115**, and a magazine retention block **400** in accordance with a firearm of the present disclosure.

DETAILED DESCRIPTION

Various embodiments will be described in detail with reference to the drawings, wherein like reference numerals

represent like parts and assemblies throughout the several views. Reference to various embodiments does not limit the scope of the claims attached hereto. Additionally, any examples set forth in this specification are not intended to be limiting and merely set forth some of the many possible embodiments for the appended claims.

The present disclosure relates generally to a firearm comprising a plurality of legacy features and a plurality of modern features. This disclosure is not limited to firearm features from any particular legacy firearm or firearms, nor to firearm features from any particular modern firearm or firearms. However, for ease of illustration, the legacy features shown in the accompanying drawings are associated with one or more versions of a World War II era assault rifle known as the Sturmgewehr (hereinafter referred to as "STG"). In addition to being visually recognizable today as STG features, these features were incorporated for utilitarian reasons in the STG, for example to reduce weight, increase durability, and/or improve reliability in STG firearms. It should be noted that the figures may show additional STG features that are not described below.

FIG. **1**A is a perspective view of a portion of an example firearm **100** in accordance with one embodiment of the present disclosure. FIG. **1**B is a perspective view of a further portion of an example firearm **100** in accordance with the embodiment of FIG. **1**A. With reference to FIGS. **1**A-**1**B, the firearm **100** includes a front **102**, a back **104**, a top **106**, a bottom **108**, a buttstock **110**, a receiver **112**, a trunnion **114**, a barrel nut **115**, an ejector port **116**, a barrel **118**, a gas tube **120**, a gas block **122** having a right side **224** and a left side **225**, a stacking post **124**, a sling loop **126**, a sight mount **128**, a magazine holder **129** for holding a magazine **131** of ammunition. With reference to FIG. **1**B, the firearm **100** includes a handgrip **160** and a charging handle **166**. The gas tube **120** includes a plurality of ridges **130** and a plurality of waists **132**. The firearm **100** also includes a trigger coupling area **134** for attaching a trigger assembly **136**.

In some examples, the firearm **100** is a semi-automatic tilting bolt rifle. The firearm **100** is defined by the front **102**, the back **104**, the top **106** and the bottom **108**. Throughout this disclosure, references to orientation (e.g., front(ward), rear(ward), in front, behind, above, below, high, low, back, top, bottom, under, underside, etc.) of structural components shall be defined by that component's positioning in FIG. **1**A relative to, as applicable, the front **102**, the back **104**, the top **106**, and the bottom **108** of the firearm **100**, regardless of how the firearm **100** may be held and regardless of how that component may be situated on its own (i.e., separated from the firearm **100**).

In general terms, the buttstock **110** is at the back **104** of the firearm **100** and rests against the body of the shooter while firing the firearm **100**. The buttstock **110** helps to support the firearm **100** while firing one or more rounds of ammunition, and can also function to transfer recoil force generated from the exploding gases associated with firing a round, thereby reducing some of the drawbacks of recoil, such as barrel kick. In this example, the buttstock **110** is shaped like a STG buttstock and is made of wood, as in the STG. In other examples, the buttstock **110** is made of different materials and/or shaped differently to resemble a firearm other than an STG. In alternative examples the buttstock **110** can be a pistol variant, AR compatible stock or a folding stock. The buttstock **110** can be removed/substituted by removing a rear take down pin **137** (FIG. **1**B) disposed in the buttstock **110** and exchanging the buttstock thereby.

The receiver **112** holds the trunnion **114** from which the barrel **118** extends forwards. The trunnion aligns various components within the receiver **112** on the one hand, and the barrel **118** on the other hand, securely maintaining the relative positioning of the various moving and stationary parts while firing the firearm **100**. The trunnion **114** has various features exclusively in common with the STG trunnion, which will be discussed below. However, unlike the STG trunnion, the trunnion **114** is configured to accommodate one or more of the following: multiple trigger assemblies **136** (e.g. semi-automatic, automatic, manual), different barrels (e.g. different lengths, calibers, and so forth), different bolt assemblies, different bolts, different ammunition calibers, and so forth.

Similarly, because the barrel **118** is interchangeable with other barrels, components coupled to the barrel, directly or indirectly (i.e., parts of a barrel assembly) are also interchangeable with corresponding components from other model firearms, including but not limited to the gas tube **120**, the gas block **122**, the gas piston partially housed within the gas tube **120** (discussed below), a charging handle, hand grips, scopes, sights or mounts that are mounted to the barrel and/or the gas tube, and so forth.

In some examples, a barrel extension couples the barrel **118** to the trunnion **114**, enabling interchangeability of one or more parts of the barrel assembly; in other examples, the trunnion **114** is configured to removably couple directly to the barrel **118**. Removable coupling of the trunnion **114** and the barrel **118** can be accomplished with the barrel nut **115**, which is itself removably secured (via screw threads) to the trunnion **114**. The STG trunnion and barrel assembly are pinned in place and essentially permanent fixtures of the STG that are not interchangeable. In contrast, the firearm **100** uses a barrel nut **115** to keep the barrel assembly in place on the trunnion **114**. Thus, the barrel nut **115** allows the firearm **100** to have interchangeable barrels, which in turn allows for end user customization (e.g., by modifying the dimensions and characteristics of the barrel nut **115**) as well as permitting the use of different calibers in the same receiver by swapping barrel assemblies. In some examples, the firearm **100** includes a barrel **118** identical to a model AR-15 platform barrel. In other examples the barrel **118** is a different model barrel, including but not limited to a pistol barrel and a carbine barrel.

The ejector port **116** is a window in the receiver through which spent ammunition cartridge casings are discharged during a firing cycle. In some examples a pivotal flap, hinged either below or above the ejector port **116**, can block the ejector port **116** and prevent unwanted dust and other debris from entering the receiver while the firearm **100** is not being used. The barrel **118** has an interior bore through which a projectile travels when the firearm is fired, and ultimately exits the front of the barrel **118** travelling towards a target. The gas tube **120** contains a spring biased gas piston powered by fast moving gas that has been redirected from the barrel **118** during a firing cycle by the gas block **122**. The redirected gas travels rearwards down the gas tube **120**, causing rearward movement of the gas piston against the spring bias. The rearwards movement of the gas piston causes the gas piston to engage a bolt carrier at the forward end of a bolt assembly (partially contained within the receiver **112**), and push the bolt assembly rearwards, which in turn engages the trigger assembly **136** (FIG. **1**B), causing the trigger assembly to reset into a position capable of firing another round (e.g., for repeat fire). Rearward motion of the bolt assembly can also result in automatic ejection of the spent cartridge casing through the ejector port **116**, and the

automatic loading of a new cartridge into a chamber from a magazine. The gas piston then reciprocates forward on the bias of the spring. In some examples, the bolt assembly is slidably disposed in the trunnion **114** within the receiver **112** for axially reciprocating recoil movement therein during the firing cycle sequence of the firearm **100**. The trigger assembly **136** typically includes a spring-biased hammer that is cocked and then released by a sear upon actuating a triggering mechanism. The hammer strikes a firing pin carried by the bolt of the bolt assembly, which in turn is thrust forward to contact and discharge a cartridge loaded in the chamber.

The gas tube **120** includes features from the STG, including but not limited to the ridges **130** and the waists **132**. The ridges **130** run longitudinally along at least a portion of the outer surface of the gas tube **120**. The waists **132** are ridge-less depressed rings in the exterior surface of the gas tube **120** that are transverse to the ridges **130** and can reduce the overall weight of the firearm **100**. As shown in FIG. **1**, the ridges **130** are disposed behind, between, and in front of the waists **132** on the gas tube **120**. In some examples, a handgrip **160** (FIG. **1**B; discussed below) is coupled to the firearm **100** by mating one or more grooves in the handgrip with ridges **130** on the gas tube **120** (e.g., by a frictional male-female fit), as was done on the STG. Unlike the STG, in the firearm **100** hand grips can be modified or swapped out to cooperate with alternative barrel assemblies (e.g., barrel assemblies containing longer or shorter barrels, or thicker or thinner barrels).

The interchangeability of the various barrel assembly components of the firearm **100** further allows for gas tubes of different lengths (e.g., mid-length, carbine length, pistol length) to be substituted for the gas tube **120**. In some examples, the user of the firearm **100** can remove the gas tube **120** and shorten it, e.g., with a hacksaw.

The stacking post **124** is a STG feature that enables storage of multiple firearms by stacking multiple firearms on the ground, e.g., in a cone or pyramid-type formation. In some examples, unlike the STG stack post, the stacking post **124** is removable and/or replaceable. For example, the stacking post **124** may optionally include a rear mounting portion for removably mounting (e.g., by screwing and unscrewing) in/to a complementary mounting portion in the front of the gas block **122**.

In some examples, the gas block **122** is removable from the barrel assembly by two set screws that mate to corresponding detents in the barrel **118**. This allows the same user to have multiple (i.e., different) barrels and one gas block for their firearm **100**.

The sling loop **126** (FIG. **1**A) extends from the side (in this example, the right side **224**) of the gas block **122**. The sling loop **126** is configured for coupling to the end of a sling used to carry the firearm **100** around, e.g., a person's shoulders. The positioning of the sling loop **126** on the gas block **122** exists in the STG as well. In some examples, unlike the STG, the sling loop **126** is removable.

The sight mount **128** is mounted to the top of the receiver **112**. Unlike the STG the sight mount **128** is removable, allowing interchanging between different mounts and sights from different model firearms. The sight mount **128** includes a mounting means such as mounting ribs. Such mounting ribs can be standard dimension such as a "Picatinny" style mounting platform (shown at **140** in FIG. **1**A), also known as MIL-STD-1913, for facilitating mounting and interchanging of sights on the sight mount **128**. An alternative mounting platform **139** is shown in FIG. **1**B.

The trigger coupling area **134** (FIG. **1**A) is an area of the firearm **100** to which any of a variety (e.g., semi-automatic, automatic, etc.) of trigger assemblies (e.g., trigger assembly **136** shown in FIG. **1**B) may be installed, replaced, and/or substituted in the firearm **100**. In some examples the design of the housing for a trigger assembly coupled to the trigger coupling area **134** is identical or similar to that of the STG, while requiring fewer operating components (e.g., pivot pins, locating studs and/or clockwork parts) in order to function, as available in modern trigger mechanisms.

FIG. **2** is a perspective view of a first portion of the firearm **100** of FIG. **1**. In FIG. **2**, the firearm **100** includes the receiver **112**, the trunnion **114**, the barrel nut **115**, the ejector port **116**, the barrel **118**, the gas tube **120**, the sight mount **128**, the magazine holder **129**, and the ridges **130**, as discussed above. In addition, in this example the rear sight mount includes mounting ribs **140** (discussed above), mounting means (e.g., screws) **141** elongated for removably mounting the mounting ribs **140** to the receiver **112**, and the receiver **112** has an external surface **143** wherein the receiver comprises an inner cavity at least partially filled by the trunnion **114**, the external surface **143** of the receiver **112** having a front end **150**, a rear end **151**, a top **152**, a bottom **153**, a right side **154**, and a left side opposite the right side **154**. On the right side **154** are disposed two vertically oriented elongated recesses **142** toward the front end **150** of the receiver **112** and extending upwardly from the bottom **153** of the receiver **112**, one horizontally oriented elongated recess **144** behind the vertically oriented elongated recess **142** and extending forwardly from the rear end **151** of the receiver **112**, and a conical depression **146** behind the vertically oriented elongated recesses **142** and below the horizontally oriented elongated recess **144**. In some examples, additional features corresponding to one or more of the vertically oriented elongated recesses **142**, the horizontally oriented elongated recess **144**, and the conical depression **146** is/are disposed on the opposite side as that shown in FIG. **2** (i.e., the right side) of the receiver **112** as well. The geometric configuration of the conical depression **146** in relation to the vertically oriented elongated recesses **142** and the horizontally oriented elongated recesses **144** is a byproduct of pressing the sheet metal of the trunnion **114** together with the receiver **112**, and provides for an extremely strong, effectively irreversible attachment of the receiver **112** and the trunnion **114**.

The vertically oriented elongated recesses **142**, the horizontally oriented elongated recess **144**, and the conical depression **146** are STG features that are the result of permanently mating the trunnion to the receiver by pressing the sheet metal of the receiver into the various recesses and grooves on the outer surface of the trunnion (which are themselves cast or machined). It should be noted that although example firearms of the present disclosure include one or more of these STG features, the actual means by which the trunnion **114** and the receiver **112** are permanently mated need not be the same as the STG. Attaching the receiver **112** and the trunnion **114** will be discussed in more detail below. For example, the firearm **100** may include the vertically oriented elongated recesses **142**, the horizontally oriented elongated recess **144**, and the conical depression **146** even though the trunnion **114** and the receiver **112** are mated to each other through means other than pressing sheet metal (e.g. rivets, pins, screws, soldering, welding etc.).

FIG. **3** is a perspective view of a second portion of the firearm **100** of FIG. **1** including a mounted example handgrip **160**. The example firearm **100** includes a receiver **112**, a barrel **118**, a gas tube **120**, a gas block **122**, ridges **130**,

and waists **132** as discussed above. In addition, in this example, the firearm **100** includes a handgrip **160** having a gripping portion **162** and a mating groove **164**, and the firearm **100** includes a charging handle **166**.

The gripping portion **162** of the handgrip **160** provides a place for the shooter to conveniently and safely hold the front part of the firearm **100** without, e.g., getting burned by the barrel **118**. In this example, the external appearance of the handgrip **160** resembles a STG handgrip. However, the handgrip **160** can be interchanged with one or more different handgrips to mount to and cooperate with different barrel assemblies, gas tubes, and so forth. The groove **164** on either side of the handgrip **160** mates with a ridge **130** on the gas tube **120** in order to couple the handgrip **160** to the firearm **100**, as in the STG. The charging handle **166** allows for manual reset of the trigger mechanism and bolt assembly by pulling rearwards on the charging handle. Pulling rearwards on the charging handle has the same effect as pressurized gas in the gas tube **120** pushing the gas piston rearwards if, e.g., the automatic reset fails. In some examples the configuration of the charging handle **166** is consistent with the STG charging handle. In alternative examples, however the charging handle **166** is coupled to the gas piston rather than the bolt carrier (as in the STG), allowing for easier removal, replacement, and/or substitution of the charging handle **166** (e.g. by replacing the gas piston only, rather than replacing the entirety or a portion of the bolt assembly in conjunction with the gas piston).

FIG. **4**A is a perspective view of a third portion of the firearm **100** of FIG. **1**; FIG. **4**B is a bottom perspective exploded view of a portion of the front sight portion of FIG. **4**A. The firearm **100** includes the barrel **118**, the gas tube **120**, the gas block **122**, the stacking post **124**, and the sling loop **126** as discussed above. In addition, in this example the firearm **100** includes a front sight assembly **180**, and the stacking post **124** includes a mounting portion **182**. In some examples, the mounting portion **182** allows the stacking post **124** to be removed, replaced, and/or substituted from the gas block **122**, as discussed above (e.g., by screwing the mounting portion **182** into or out of the gas block **122** via screw threads).

Although in this example the front sight assembly **180** looks externally like its STG counterpart, in some examples, unlike the STG, the front sight assembly **180** can be adjusted for windage (left to right), allowing the user to properly "zero" their rifle. As shown in the example in FIG. **4**B, the front sight assembly **180** includes two set screws **184** that are removably coupled to corresponding holes **185** and **186** in the bottom of the front sight assembly **180** and the bottom of the barrel **118**, respectively, the holes **186** being disposed in a recessed area **187** of the barrel **118**. The recessed area **187** provides a shoulder **188** against which the front sight assembly **180** rests, reducing the possibility of rearward slippage of the front sight assembly **180** along the barrel **118**. Adjusting the set screws **184** allows for adjustments of the front sight assembly **180** to account for windage. This functionality is not available on the STG. A muzzle **189** removably secured to the screw threads **191** disposed at the forward end of the barrel **118** forwardly secures the front sight assembly **180** to the firearm **100**.

Referring to FIG. **4**A, the gas block **122** shown in FIG. **4** includes the right side **224** as discussed above. In addition, in this example, the gas block **122** includes an upper portion **220**, a lower portion **221**, a waist **222** disposed between the upper portion **220** and the lower portion **221**, a top **225**, a bottom **226**, a front **227**, and a back **228**. The sling loop **127** extends from the right side **224** of the waist **222**. The back **228** of the upper portion **220** removably mates with the front end of the gas tube **120**. The lower portion **221** removably mates with a radially expanded section **229** of the barrel **118**, and the gas block **122** and the barrel **118** are attached (unlike the STG) via one or more set screws on the bottom **226** of the gas block **122**. The mounting portion **182** of the stacking post **124** removably mates with the gas block **122** at the front **227** of the upper portion **220** of the gas block **122**.

FIG. **5** is a perspective view of the example handgrip **160** of FIG. **3**; FIG. **6** is a side view of the handgrip **160** of FIG. **3**; FIG. **7** is a cross-sectional view of the handgrip **160** of FIG. **3** along the line A-A in FIG. **6**. As shown in FIGS. **5-7**, the handgrip **160** includes the gripping portion **162** and the grooves **164** as discussed above. In addition, with reference to FIGS. **6-7**, the interior surface **192** of the handgrip **160** includes a plurality of ribs **190** corresponding to indentations **194** on the exterior surface **196** of the handgrip **160**. In some examples, the grooves **164** are configured to mate with the ridges (e.g., the ridges **130** (FIG. **3**)) of the gas tube **120** (FIG. **4**) that is itself mounted to one of a variety of different barrel lengths and/or barrel calibers.

FIG. **8** is a perspective view of an example gas piston **200** and a bolt carrier **203** in accordance with the present disclosure. The gas piston **200** includes a spring **202**. The gas piston **200** is partially housed by the gas tube **120** (FIG. **1**) as discussed above, and its purpose and the purpose of the spring **202** are discussed above. In this embodiment the charging handle **166** is coupled to the bolt carrier **203**. In some examples, the charging handle **166** is removably coupled to the bolt carrier **203**. In other examples, the charging handle **166** is permanently coupled to the bolt carrier **203**. In further embodiments the charging handle is coupled to the gas piston **200** directly, facilitating removal, replacement, and/or substitution of the gas piston **200** from the firearm **100** (FIG. **1**).

FIG. **9** is a perspective view of an embodiment of an example barrel assembly **215** and bolt assembly **213** in accordance with the present disclosure. In this example the barrel assembly **215** includes the barrel nut **115**, the barrel **118** having the radially expanded section **229**, the gas block **122**, the charging handle **166**, the gas piston **200**, and the spring **202** as discussed above. In this example the barrel assembly **215** also includes a gas piston extension **218** and the gas block **122** includes a recess **216**, which is a STG feature designed at least in part to reduce the overall weight of the firearm. As further shown in this example, the gas block **122** includes the upper portion **220**, the lower portion **221**, and the waist **222** disposed between the upper portion **220** and the lower portion **221** as discussed above. In addition, the gas block **122** includes a left side **223**. The recess **216** is disposed in the left side **223** of the waist **222**.

In other examples, the barrel assembly **215** optionally also includes one or more features that are mounted to or integral with one or more of the foregoing components of the barrel assembly (e.g., the front sight assembly **180** (FIG. **4**), the stacking post **124** (FIG. **4**), the sling loop **126** (FIG. **4**), and/or the handgrip **160** (FIG. **3**)). The barrel **118** includes a trunnion engaging portion **240** having an annular rib **242** and an index pin **246** extending from the top of the trunnion engaging portion **240** behind the annular rib **242**. The barrel nut **115** includes a rear edge **244**. When the barrel **118** is assembled together with the trunnion **114** (FIG. **1**), the rear edge **244** of the barrel nut **115** contacts the front of the annular rib **242**, preventing forward movement of the barrel **118**. In addition, the rear of the annular rib **242** contacts a corresponding annular rib **248** (FIG. **20**) protruding from the surface of the bore **314** (FIG. **20**) of the trunnion **114** (FIG.

20), preventing rearward movement of the barrel **118** further into the trunnion **114** (FIG. **1**). In addition, the index pin **246** mates with a corresponding cutout **249** (FIG. **20**) in the top of the annular rib **248** (FIG. **20**) of the trunnion **114** (FIG. **20**) to properly align the barrel **118** and the rest of the barrel assembly with the other parts of the firearm **100** (FIG. **1**).

In the example shown in FIG. **9**, the bolt assembly **213** includes the bolt carrier **203** as discussed above having a bolt engagement portion **201**, and also includes a set screw **217** and a bolt block **219**. The bolt assembly **213** also includes a bolt **250** (see discussion below in connection with FIGS. **13-15**). The bolt **250** is pulled rearwards by the bolt carrier **203**, which engages or "carries" the bolt **250** by the bolt engagement portion **201** during a trigger reset. Also shown in FIG. **9** is a magazine **131** containing one or more rounds of ammunition **214**.

In this example, the charging handle **166** is coupled directly (permanently or removably) to the gas piston **200** for ease of removal, replacement, and/or substitution of the gas piston **200**, allowing the user to easily substitute a different barrel assembly (or one or more barrel assembly components) for the barrel assembly **215** or one or more of its components, respectively. This feature is distinguishable from the STG in which the charging handle is permanently affixed to the bolt carrier and the bolt carrier is permanently affixed to the gas piston, rendering the removal/replacement/substitution of these components virtually impossible.

FIG. **9** also shows the gas piston extension **218** which removably couples to the bolt carrier **203**. This coupling allows the gas piston **200** and the bolt carrier **203** to move forwards and rearwards in tandem during a firing cycle. When the bolt **250** (FIGS. **13-15**) is thrust forward upon pulling of a trigger, a pin in the bolt contacts a round from the ammunition **214** that is loaded in a chamber, discharging the bullet forward through the barrel **118**. The bolt block **219** and the set screw **217** are disposed at the rear of the trunnion **114** (FIG. **1**) and allow the user to calibrate the firearm with the appropriate headspace between the bolt **210** and the bullet when the firearm is in a fire-ready position. Manual adjustment of the positioning of the bolt block **219** via the set screw **217** allows the user to calibrate the firearm (e.g., the firearm **100** of FIG. **1**) for different caliber ammunition, an option not available on the STG. FIG. **16** is a partial rear perspective view of the trunnion **114** of FIG. **1** showing the bolt carrier **203** and the set screw **217**. In some examples the magazine **131** holds STANAG (Standardization Agreement **4179**) ammunition, though, as just described, the firearm **100** (FIG. **1**) can be modified to support different types of ammunition as desired by the user.

FIG. **10** is a side cross-sectional view a portion of the barrel assembly **215** of FIG. **9**. The barrel assembly **215** includes the barrel **118** having the radially expanded section **229**, the gas tube **120** having the waists **132**, the gas piston **200**, the stacking post **124** having the mounting portion **182**, and the gas block **122** having the upper portion **220**, the lower portion **221**, the waist **222**, the top **225**, the bottom **226**, the front side **227**, and the rear side **228**. In addition, in this example the gas block **122** also includes a gas redirecting element **230**, set screws **231**, screw threads **232**, and a gas channel **233**; the gas tube **120** includes a forward end **234**; and the barrel **118** includes an internal bore **235**.

The gas redirecting element **230** redirects gas (generated from firing a firearm) flowing upwards along the gas channel **233** from the internal bore **235** of the barrel **118** rearwards down the gas tube **120** such that it pushes the gas piston **200** rearwards as discussed above. The vertically oriented gas channel **233** is in gaseous communication with both the internal bore **235** of the barrel **118** and the interior of the gas tube **120**. The set screws **231** secure the bottom **226** of the gas block **122** into corresponding screw holes in the bottom of the radially expanded section **229** of the barrel **118**. The forward end **234** of the gas tube **120** connects towards the rear side **228** of the upper portion **220** of the gas block **122**. The mounting portion **182** of the stacking post **124** removably mounts to the screw threads **232** disposed towards the front side **227** of the gas block **122**.

FIG. **11**A is a perspective view of an example barrel nut **115** used with the firearm **100** of FIG. **1**. FIG. **11**B is a front view of the barrel nut **115** of FIG. **11**A. FIG. **11**C is a side view of the barrel nut **115** of FIG. **11**A. The barrel nut **115** includes the rear edge **244** described above, as well as a threaded portion **270** and a castellated portion **272**, the castellated portion **272** having interspersed notches **274**. The notches **274** are engageable by a barrel nut wrench and thereby facilitate sufficient torqueing of the barrel nut **115** to the trunnion **114** (FIG. **1**) with a barrel nut wrench. The threaded portion **270** removably engages a corresponding threaded portion on an interior surface of the trunnion **114** (FIG. **1**) to removably secure a barrel **118** (FIG. **1**) to the trunnion **114**. In this example, the barrel nut **115** has an inner diameter d_1, and an outer diameter d_2. Each of the notches **274** has a width w_1 and a height h_1. The barrel nut **115** has a height h_2. In some examples, the inner diameter d_1 is in a range from about 22 mm to about 28 mm. In a particular example, the inner diameter d_1 is about 25 mm. In some examples, the outer diameter d_2 is in a range from about 27 mm to about 33 mm. In a particular example, d_2 is about 30 mm. In some examples, each of h_1 and w_1 is in a range from about 3 mm to about 7 mm. In a particular example, each of h_1 and w_1 is about 5 mm. In some examples, h_2 is in a range from about 20 mm to about 30 mm. In a particular example, h_2 is about 26 mm. The values for d_1, d_2, h_1, h_2 and w_1 can also fall outside of these ranges.

In some examples, at least d_2 and h_2 are selected to ensure compatibility between the barrel nut **115** and the trunnion **114** (FIG. **1**). In some examples, at least d_1 is selected to ensure compatibility between the barrel **118** (FIG. **1**) and the barrel nut **115**, and thereby compatibility between the barrel **118** (FIG. **1**) and the trunnion **114** (FIG. **1**). The STG did not include a barrel nut, and the barrel was permanently attached to the trunnion. As described below the trunnion **114** (FIG. **1**) of the present disclosure allows the trunnion to be interchangeable with various barrels and barrel assemblies through the use of the barrel nut **115**.

FIG. **12** is an expanded view of the rear portion of the barrel **118** of FIG. **1**, showing the trunnion engaging portion **240** of the barrel **118** and the annular rib **242**. In addition, in this example the barrel **118** includes a recess **241** to house the index pin **246** (FIG. **9**), and a rear end **243**. The trunnion engaging portion **240** mates with the trunnion **114** (FIG. **1**) and barrel nut **115** (FIG. **1**) in the manner described above in connection with FIG. **9**. In addition, the trunnion engaging portion **240** is configured to be removably mated with the barrel nut **115** (FIG. **1**) and the trunnion **114** (FIG. **1**), e.g., by unscrewing the barrel nut **115** from the trunnion **114**, removing the barrel engaging portion **310** from the trunnion **114**, and sliding the barrel nut **115** off the barrel **118**. Removable coupling of the barrel **118** to the trunnion **114** (FIG. **1**) in this manner allows for replacement and/or substitution of the barrel **118** and other components of the barrel assembly **215** (FIG. **9**).

As shown in FIG. **12**, there is a distance d_3 between the rear end **243** of the barrel **118** and the rear of the annular rib **242**. The distance d_3 is selected to correspond to the distance

between the front of the annular rib **248** (FIG. **20**) in the trunnion **114** (FIG. **20**) and the rear edge **244** of the barrel nut **115** (FIG. **9**) when the barrel nut **115** (FIG. **9**) is fully screwed into the trunnion **114** (FIG. **20**). This effectively sandwiches the trunnion engaging portion **240** of the barrel **118** between the barrel nut **115** and the annular rib **248** of the trunnion **114**, thereby preventing movement of the barrel **118** relative to the trunnion **114** (FIG. **1**). Thus, by substituting differently dimensioned barrel nuts **115**, the user of the firearm **100** can substitute barrels **118** having differently dimensioned trunnion engaging portions **240**.

FIG. **13** is a front view of an example bolt **250** that can be used with a firearm of the present disclosure; FIG. **14** is a rear view of the bolt **250** of FIG. **13**; and FIG. **15** is a side view of the bolt **250** of FIG. **13**. The bolt **250** can be identical or similar in appearance and features to a bolt used in an STG. In this example, the bolt **250** is highly reminiscent of an STG bolt in appearance. Alternatively, a modern firearm bolt configuration may be used. As shown in FIGS. **13-15**, the example bolt **250** includes a front face **251**, a rear face **252**, a bolt carrier engagement portion **253**, a firing pin hole **254**, an extractor recess **255** having an extractor engagement portion **256**, and the front face **251** includes a cartridge interface **257**. As in the STG, the example bolt **250** also includes a weight reducing groove **258**, which desirably reduces the weight of the bolt **250** and thereby the overall firearm **100** (FIG. **1**).

The front face **251** faces toward the front of the firearm (e.g., the firearm **100** as in FIG. **1**) and engages the rear of the cartridge of a round of ammunition in the cartridge interface **257** when the trigger is cocked and ready to fire a round of ammunition **214** housed in the firearm chamber. The rear face **252** faces toward the rear of the firearm (e.g., the firearm **100** as in FIG. **1**). The bolt carrier engagement portion **253** engages the bolt engagement portion **201** (FIG. **9**), allowing the bolt **250** and the bolt carrier **203** (FIG. **9**) to move forward and rearwards in tandem during each firing cycle. The firing pin hole **254** houses a firing pin during operation of a firearm **100** (FIG. **1**), which, upon pulling of the trigger, strikes the rear of the ammunition round, causing an explosion that drives a projectile (e.g., a bullet) forwards from its cartridge and down the barrel **118** (FIG. **1**). After the projectile has been released the spent cartridge remains briefly engaged by the cartridge interface **257**. As the bolt reciprocates rearwards from the force applied by the gas piston **200** (FIG. **9**) on the bolt carrier **203** (FIG. **9**) as discussed above, the bolt **250** rotates, forcing the spent cartridge into the extractor recess **255**. In some examples, a spring loaded extractor platform is pivotally secured to the extractor engagement portion **256** within the extractor recess **255**. The bias of the spring ejects the spent cartridge through the ejector port **116** (FIG. **7**) as another round of ammunition **214** (FIG. **9**) is loaded from the magazine **131** (FIG. **9**) into the chamber.

FIG. **17** is a top front perspective view of an example trunnion **114** in accordance with the present disclosure; FIG. **18** is a left side view of the trunnion **114** of FIG. **17**; FIG. **19** is a rear view of the trunnion **114** of FIG. **17**; FIG. **20** is a front view of the trunnion **114** of FIG. **17**; FIG. **21** is a right side view of the trunnion **114** of FIG. **17**; and FIG. **22** is a bottom view of the trunnion **114**. As shown in FIGS. **17-19** and **22**, the example trunnion **114**, as in an STG trunnion includes two vertically oriented elongated recesses **300** on the left side and the right side toward the front, and a horizontally oriented elongate recess **302** near the top of the trunnion **114** on the left side and right side disposed behind the vertically oriented elongated recesses **300**, and a conical depression **304** towards the rear of the trunnion **114** and below the horizontally oriented elongated recess **302**. The trunnion **114** coordinates a barrel assembly and bolt assembly for repeat firing of a firearm. The example trunnion **114** also includes an outer surface **301**, a front face **306**, a rear face **308**, a barrel engaging portion **310**, screw threads **312**, a bore **314**, a slot **315**, an ejector cutout **316**, a left side **318**, a right side **320**, a top **322**, and a bottom **324**. The trunnion **114** also includes a curved platform **326**. With reference to FIG. **22**, the bottom **324** of the trunnion **114** includes an opening **330**. With reference to FIG. **20**, the trunnion **114** also includes the annular rib **248** extending from the surface of the bore **314**, and the cutout **249** corresponding to the index pin **246** (FIG. **9**) on the trunnion engaging portion **240** (FIG. **9**) of the barrel **118** (FIG. **9**), as discussed above in connection with FIGS. **9** and **12**.

In some examples, to maintain an outward appearance of the STG a rivet is used to attach the receiver (e.g., the receiver **112** in FIG. **1**) and the trunnion together. In some examples the trunnion **114** and the receiver **112** (FIG. **1**) are attached to each other by bending the upper receiver on a metal stamping press, inserting the trunnion **114** and through a series of resistance welds or pins permanently attaching the trunnion **114** to the receiver **112** (FIG. **2**). In some examples, the trunnion **114** is only removable from the receiver **112** (FIG. **2**) by irrevocably destroying the receiver **112** (FIG. **2**). In some examples, once the trunnion **114** is inserted into the receiver **112** (FIG. **2**) and a series of welds are performed, the upper portion of the receiver **112** (FIG. **2**) is pressed strongly into the trunnion **114** and is bent in such a way to correspond to at least: the vertically oriented elongated recesses **300** (corresponding to the vertically oriented elongated recesses **142** of FIG. **2**); the horizontally oriented elongated recess **302** (corresponding to the horizontally oriented elongated recess **144** of FIG. **2**); and the conical depression **304** (corresponding to the conical depression **146** of FIG. **2**) on both the left side **318** and the right side **320** of the trunnion **114**, in order to thereby immobilize the trunnion **114** and the receiver **112** (FIG. **2**) together.

The front face **306** faces frontwards when the trunnion **114** is installed in a firearm **100** (FIG. **1**); and the rear face **308** faces rearwards. The barrel engaging portion **310** receives the trunnion engaging portion **240** (FIG. **12**) of the barrel **118**, typically within a barrel nut **115** (FIG. **1**) that has been secured (e.g., via screw action) to the screw threads **312** disposed within the barrel engaging portion **310**. The bore **314** houses the bolt assembly **213** (FIG. **9**) and allows for forward and rearward movement of the bolt assembly **213** (FIG. **9**) therein during each firing cycle. The slot **315** is a longitudinal (from the rear face **308** towards the front face **306**) opening in the top of the bore **314**. The slot **315** allows the bolt assembly **213** (FIG. **9**) to cooperate with the gas piston **200** (FIG. **9**), which is disposed above the trunnion **114** and rests partially in the curved platform **326** on the top **322** of the trunnion **114**. The ejector cutout **316** is in open communication with the ejector port **116** (FIG. **1**) of the receiver **112** (FIG. **1**) and permits sufficient space for spent cartridges to be ejected through the ejector port **116** (FIG. **1**).

The opening **330** in the bottom **324** of the trunnion **114** allows for cooperation between the bolt assembly **213** (FIG. **9**) housed within the trunnion **114** on the one hand, and the magazine **131** (FIG. **9**) containing one or more rounds of ammunition **214** (FIG. **9**) on the other hand, the ammunition **214** (FIG. **9**) being loaded upwards into the trunnion **114** from the magazine **131** (FIG. **9**) via spring action during each firing cycle. In one example, in contrast to the corre-

sponding aspect of a STG, the opening **330** is sized and shaped to accommodate the feeding of ammunition from a STANAG pattern magazine.

With reference to FIGS. **17** and **21**, ejector pinholes **340** on either side of the trunnion **114** are configured to receive pins for mounting an ejector inside the trunnion **114**, the ejector being configured to catch spent ammunition cartridges from the bolt and discharge the spent cartridges through the ejector port **116** (FIG. **1**). In some examples, relative to ejector pinholes on the STG, the ejector pinholes **340** (and, correspondingly, the pins they receive) are closer to each other and offset rearwards, i.e. closer to the rear face **308** of the trunnion **114**, than in a STG. In some examples, the pinholes **340** are in a range from about 0.1 mm to about 2.0 mm closer to each other and the rearmost pinhole **340** on either side of the trunnion **114** is in a range from about 3 mm to about 7 mm closer to the rear face **308** of the trunnion **114**, as compared with a STG. In a particular example, the pinholes **340** are about 0.5 mm closer to each other, and the rearmost pinhole **340** on either side of the trunnion **114** is about 5.5 mm closer to the rear face **308** of the trunnion **114**, as compared with a STG. The offset of the ejector pinholes **340** as compared with the ejector pinholes on the STG can help to accommodate the other modifications to the trunnion **114** (e.g., its configuration to removably couple to a barrel, the presence of the bolt block **219** (FIG. **9**), the caliber of ammunition received in the trunnion **114**, and so forth) that enable the trunnion **114** to accommodate interchanging firearm components.

With further reference to FIGS. **17** and **21**, a forward pinhole **342** on either side of the trunnion **114** is configured to receive a pin that passes through corresponding pinholes in either side of the receiver **112** (FIG. **1**). In some examples, a bolt is passed through the receiver **112** and the forward pinhole **342** on both sides of the receiver **112** and the trunnion **114**, and the pin is then riveted to the outer surface of the receiver **112**, which can help permanently secure the receiver **112** and the trunnion **114**. In some examples, the forward pinhole **342** has a smaller diameter than a corresponding forward pinhole on the trunnion of a STG. In some examples, the forward pinhole **342** has a diameter that is smaller than the corresponding pinhole on a STG by an amount in a range from about 1 mm to about 6 mm. In a particular example, the forward pinhole **342** has a diameter that is approximately 3 mm smaller than the corresponding pinhole on a STG.

In some examples, relative to the forward pinhole on a STG, the forward pinhole **342** on either side of the trunnion **114** (and, correspondingly, the pin it receives) is offset rearwards, i.e. closer to the rear face **308** of the trunnion **114**, than in a STG. In some examples, the forward pinhole **342** is in a range from about 10 mm to about 30 mm closer to the rear face **308** of the trunnion **114**, as compared with a STG. In a particular example, the forward pinhole **342** is about 18 mm closer to the rear face **308** of the trunnion **114**, as compared with a STG. The offset of the forward pinhole **342** as compared with the forward pinhole on a STG, as well as the smaller diameter, can help to accommodate the other modifications to the trunnion **114** that enable the trunnion **114** to accommodate interchanging firearm components (e.g., an interchangeable barrel, the inclusion of screw threads on an inner surface of the trunnion **114** and forward of the forward pinhole **342**, the screw threads removably receiving a barrel nut for removably coupling a barrel to the trunnion **114**).

With reference to FIG. **19**, disposed below the bore on the rear face **308** of the trunnion **114** is a threaded hole **344** configured to receive the set screw **217** (FIG. **9**) for adjusting the bolt block **219** (FIG. **9**), as discussed above. STG trunnions do not include a bolt block; nor do STG trunnions provide the capability to calibrate the firearm for different caliber ammunition through use of a bolt block. As such, STG trunnions do not include the threaded hole **344**.

With further reference to FIG. **19**, the trunnion **114** has an overall width w_2, an overall height h_3, and the upper curved portion has an outer radius r_1. In some examples, each of w_2, h_3 and r_1 is larger than the corresponding dimension in a STG in order to accommodate interchanging of firearm components in the firearm **100** (FIG. **1**), e.g., through the use of a barrel nut **115** (FIG. **1**) removably disposed in the bore **314** of the trunnion **114**. In some examples, w_2 is larger than the corresponding dimension in a STG by an amount in a range from about 1 mm to about 10 mm; h_3 is larger than the corresponding dimension in a STG by an amount in a range from about 0.5 mm to about 5 mm; and r_1 is larger than the corresponding dimension in a STG by an amount in a range from about 1 mm to about 8 mm. In a particular example, w_2 is about 40 mm, and about 5 mm wider than the corresponding STG dimension; h_2 is about 53 mm, and about 1.5 mm higher than the corresponding STG dimension; and r_1 is about 18.5 mm, and about 3 mm greater than the corresponding STG dimension.

FIG. **23** is a perspective view of a magazine retention block **400** that can be used in a firearm (e.g., the firearm **100** of FIG. **1**) in accordance with the present disclosure; FIG. **24** is a bottom view of the magazine retention block **400** of FIG. **23**. The magazine retention block **400** assists in coupling a magazine **131** (FIG. **9**) to the trunnion **114** (FIG. **1**) and smoothly and repeatedly feeding rounds of ammunition (e.g., ammunition **214** in FIG. **9**) from the magazine **131** (FIG. **9**) into a chamber for firing from the firearm. In the addition, the structure of the magazine retention block **400**, and its placement within the receiver of the firearm reinforces the strength of the receiver. The magazine retention block **400** is not a feature of the STG.

FIG. **25** is a perspective view of a portion of the trunnion **114** and the magazine retention block **400**, showing the bolt carrier **203**, the vertically oriented elongated recess **300**, the horizontally oriented elongated recess **302**, and the conical depression **304** discussed above. In addition, in this example a magazine release mechanism **402** including a button **404** is coupled to the magazine retention block **400**.

FIG. **26** is a perspective view of a portion of the receiver **112** of FIG. **1**B, including the trigger coupling area **134**, the magazine holder **129**, and the ejector port **116** as described above. FIG. **27** is a left side perspective view of the trunnion **114**, the barrel nut **115**, and the magazine retention block **400** as described above.

With reference to FIGS. **23-27**, the magazine retention block **400** includes a tapered portion **406** that tapers downward toward the bottom **408** of the magazine retention block **400**. The tapered portion **406** acts as a guide that facilitates sliding and coupling of a magazine (e.g, the magazine **131** (FIG. **1**B)) to the receiver **112** (FIG. **1**B), e.g., by coupling the magazine **131** to the magazine holder **129** (FIG. **26**). An upper pin hole **410** enables, via a pin, the coupling of the magazine catch **412** to the button **404** of the magazine release mechanism **402** via a spring, the button being accessible to the user on the outside of the receiver **112** through an opening **414** in the magazine holder **129**. Pressing the button **404** compresses the spring which pivots the magazine catch **412**, thereby releasing the magazine (e.g., the magazine **131** (FIG. **1**B)) from the magazine holder **129**. A lower pin hole **416** enables, via a pin, forward pivotal

coupling of a trigger assembly **136** (FIG. **1**B) to the firearm **100** (FIG. **1**B), the pin extending through a portion of the trigger assembly **136** and through the corresponding openings **418** in the magazine holder **129**.

With reference to FIGS. **23** and **24**, a groove **420** disposed in the front face **422** of the magazine retention block **400** helps to guide rounds of ammunition upward into the chamber of the firearm **100** (FIG. **1**B) for shooting. In some examples, the width of the groove **420** tapers toward the upper surface **426** of the magazine retention block **400** to help guide ammunition rounds.

With reference to FIGS. **23**, **25**, **27** and **9**, the magazine retention block **400** is disposed beneath and abuts a pair of pins **424** that support the bolt block **219** (FIG. **9**). In some examples the upper surface **426** of the magazine retention block **400** rests up against the pair of pins **424**, which can help prevent loosening or dislodgment of the pair of pins **424** as well as the bolt block **219**.

The various embodiments described above are provided by way of illustration only and should not be construed to limit the claims attached hereto. Those skilled in the art will readily recognize various modifications and changes that may be made without following the example embodiments and applications illustrated and described herein, and without departing from the true spirit and scope of the following claims.

What is claimed is:

1. A firearm, comprising:

a barrel associated with a first firearm model and having a front end and a first barrel nut engaging portion at a rear end;

a gas block;

a gas tube;

a gas piston;

a barrel nut having a threaded portion;

a charging handle;

a receiver associated with the first firearm model; and

a trunnion comprising:

an outer surface defined by a front face, a rear face, a top, a bottom, a right side, and a left side;

a bore extending longitudinally from the front face to the rear face and configured to hold a bolt and a portion of a bolt carrier;

a second barrel nut engaging portion disposed at a front end of the bore and comprising screw threads for receiving the threaded portion of the barrel nut;

a curved platform disposed on the top of the trunnion and configured to receive the gas piston;

a slot disposed on the top of the trunnion behind the curved platform, the bolt carrier extending above the slot and coupling to the gas piston above the trunnion;

an ejector cutout for ejecting spent ammunition cartridges, the ejector cutout disposed on one of the left side or right side of the trunnion;

an opening in the bottom of the trunnion for receiving ammunition from a magazine into the trunnion; and

a bolt block comprising a set screw for adjusting a position of the bolt block;

wherein the outer surface of the trunnion on each of the left side and the right side comprises a conical depression, two parallel vertically oriented elongated recesses disposed towards the front face of the trunnion and extending upwardly from the bottom of the trunnion, and a horizontally oriented elongated recess disposed behind the two vertically oriented elongated recesses and above the conical depression, the horizontally oriented elongated recess extending forwardly from the rear face of the trunnion;

wherein the second barrel nut engaging portion removably mates with the barrel nut;

wherein the barrel nut removably mates with the barrel; and

wherein the firearm is configured to substitute at least one of the barrel, the barrel nut, the gas block, and the gas tube with a component from a second firearm model; and

wherein adjustment of the set screw configures the firearm for use with a plurality of types of ammunition.

2. The firearm as in claim **1**, wherein the firearm is configured to substitute at least one of the barrel, the barrel nut, the gas block, and the gas tube with a component from a second firearm model and a component from a third firearm model.

3. The firearm as in claim **1**, further comprising a removable stacking post having a front end and a rear end, the stacking post including a mounting portion at the rear end of the stacking post, the mounting portion of the stacking post configured for removably mounting the stacking post to a front end of the gas block.

4. The firearm as in claim **1**, further comprising a handguard having an outer surface and a plurality of grooves on an inner surface, wherein the gas tube comprises an inner surface and a plurality of longitudinally extending ridges on an outer surface, and wherein each of the plurality of grooves removably mates with one of the plurality of longitudinally extending ridges to removably couple the handguard to the gas tube.

5. The firearm as in claim **1**, wherein the gas block comprises a waist, and wherein a sling loop extends from a first side of the waist of the gas block.

6. The firearm as in claim **5**, wherein a second side of the waist comprises a recess, the second side being opposite the first side.

7. The firearm as in claim **1**, wherein the firearm is a semi-automatic tilting-bolt rifle.

8. The firearm as in claim **1**, wherein the charging handle is fixedly coupled to the gas piston.

9. The firearm as in claim **1**, wherein the charging handle is removably coupled to the bolt carrier.

10. The firearm as in claim **1**, wherein the bolt block is disposed behind the bolt, and wherein the set screw is configured for adjusting a head space between the bolt and a round of ammunition in the firearm.

11. The firearm as in claim **1**, further comprising a forward sight, wherein the forward sight is removably coupled to the barrel, and wherein the forward sight comprises two forward sight set screws that couple to the barrel, the forward sight set screws being configured to adjust a position of the forward sight to account for windage.

12. The firearm of claim **1**, wherein the receiver comprises a magazine holder, and wherein the firearm further comprises a magazine retention block, the magazine retention block configured to couple the magazine to the magazine holder.

13. A firearm, comprising:

a barrel associated with a first firearm model and having a front end and a first barrel nut engaging portion at a rear end;

a magazine;

a magazine retention block comprising a top surface, a tapered portion that tapers towards a bottom of the

magazine retention block, a front surface having a groove, a magazine catch, and a magazine catch release;

a barrel nut having a threaded portion;

a receiver associated with the first firearm model and comprising a magazine holder for engaging the magazine; and

a trunnion comprising:

an outer surface defined by a front face, a rear face, a top, a bottom, a right side, and a left side;

a bore extending longitudinally from the front face to the rear face and configured to hold a bolt and a portion of a bolt carrier;

a second barrel nut engaging portion disposed at a front end of the bore and comprising screw threads for receiving the threaded portion of the barrel nut;

wherein the outer surface of the trunnion on each of the left side and the right side comprises a conical depression, two parallel vertically oriented elongated recesses disposed towards the front face of the trunnion and extending upwardly from the bottom of the trunnion, and a horizontally oriented elongated recess disposed behind the two vertically oriented elongated recesses and above the conical depression, the horizontally oriented elongated recess extending forwardly from the rear face of the trunnion;

wherein the second barrel nut engaging portion removably mates with the barrel nut;

wherein the barrel nut removably mates with the barrel; and

wherein the firearm is configured to substitute at least one of the barrel, the barrel nut, and the magazine with a component from a second firearm model.

14. The firearm as in claim **13**, further comprising a bolt block supported by a pin, and wherein the top surface of the magazine retention block abuts the pin.

15. The firearm as in claim **14**, wherein the bolt block comprises a set screw for adjusting a position of the bolt block, and wherein adjustment of the set screw configures the firearm for use with a plurality of types of ammunition.

16. The firearm as in claim **15**, wherein the bolt block is disposed behind the bolt, and wherein the set screw is configured for adjusting a head space between the bolt and a round of ammunition in the firearm.

17. The firearm as in claim **13**, wherein the magazine retention block comprises a pin hole for receiving a pin, the pin configured to couple a trigger assembly to the firearm.

18. The firearm as in claim **13**, further comprising a forward sight, wherein the forward sight is removably coupled to the barrel, and wherein the forward sight comprises two forward sight set screws that couple to the barrel, the forward sight set screws being configured to adjust a position of the forward sight to account for windage.

19. The firearm as in claim **13**, wherein the firearm is a semi-automatic tilting-bolt rifle.

20. A firearm, comprising:

a barrel associated with a first firearm model and having a front end and a first barrel nut engaging portion at a rear end;

a magazine;

a magazine retention block comprising a top surface, a tapered portion that tapers towards a bottom of the magazine retention block, a front surface having a groove, a magazine catch, and a magazine catch release;

a gas block;

a gas tube;

a gas piston;

a barrel nut having a threaded portion;

a charging handle;

a receiver associated with the first firearm model and comprising a magazine holder for engaging the magazine; and

a trunnion comprising:

an outer surface defined by a front face, a rear face, a top, a bottom, a right side, and a left side;

a bore extending longitudinally from the front face to the rear face and configured to hold a bolt and a portion of a bolt carrier;

a second barrel nut engaging portion disposed at a front end of the bore and comprising screw threads for receiving the threaded portion of the barrel nut;

a curved platform disposed on the top of the trunnion and configured to receive the gas piston;

a slot disposed on the top of the trunnion behind the curved platform, the bolt carrier extending above the slot and coupling to the gas piston above the trunnion;

an ejector cutout for ejecting spent ammunition cartridges, the ejector cutout disposed on one of the left side or right side of the trunnion;

an opening in the bottom of the trunnion for receiving ammunition from the magazine into the trunnion; and

a bolt block comprising a set screw for adjusting a position of the bolt block;

wherein the outer surface of the trunnion on each of the left side and the right side comprises a conical depression, two parallel vertically oriented elongated recesses disposed towards the front face of the trunnion and extending upwardly from the bottom of the trunnion, and a horizontally oriented elongated recess disposed behind the two vertically oriented elongated recesses and above the conical depression, the horizontally oriented elongated recess extending forwardly from the rear face of the trunnion;

wherein the second barrel nut engaging portion removably mates with the barrel nut;

wherein the barrel nut removably mates with the barrel;

wherein the firearm is configured to substitute at least one of the barrel, the barrel nut, the gas block, the magazine, and the gas tube with a component from a second firearm model; and

wherein adjustment of the set screw configures the firearm for use with a plurality of types of ammunition.

* * * * *